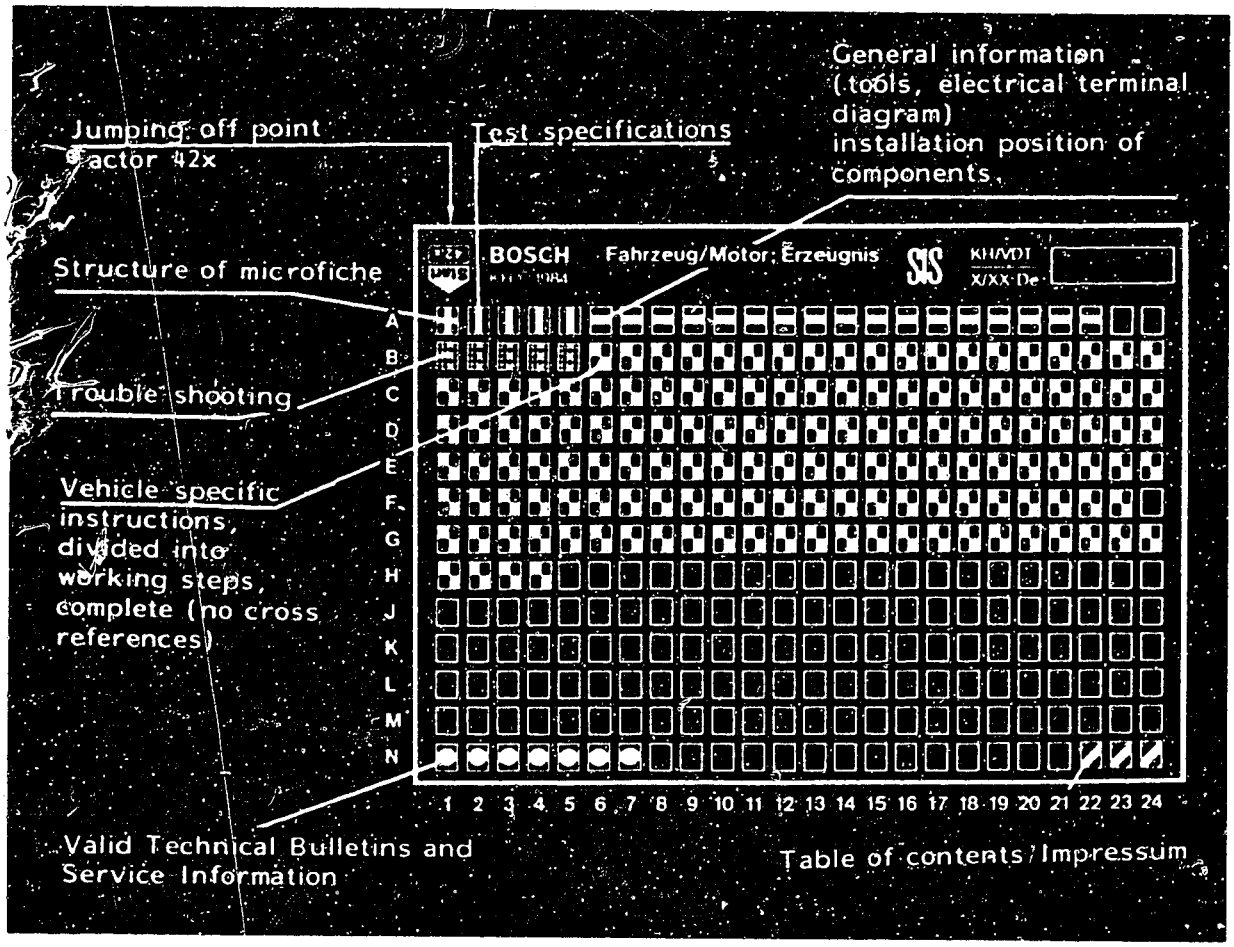
Structure of microfiche



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/component/test step
	Vehicle/engine

Coordinate

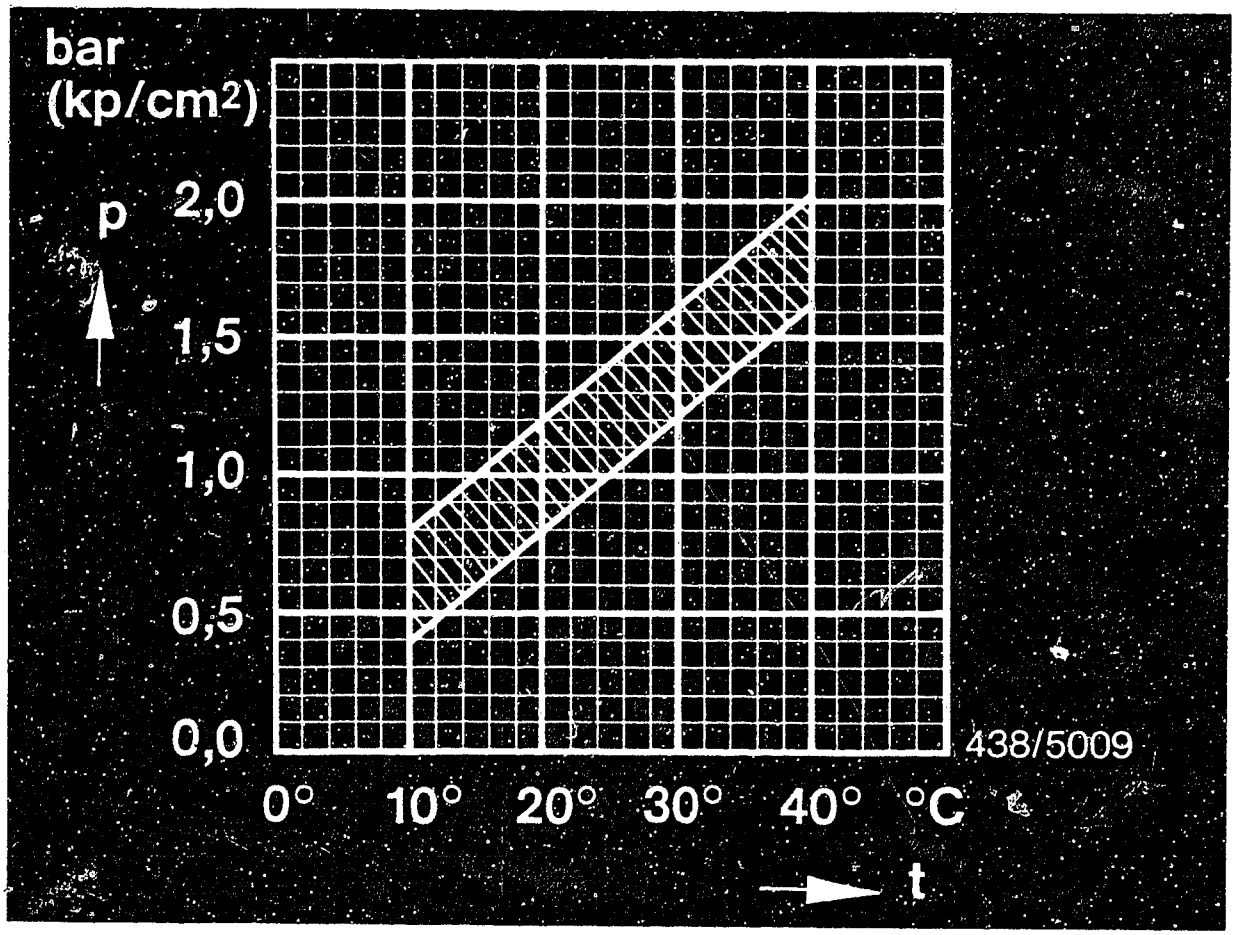
3. Limits of section

Beginning | Mid-section | End | One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6



p = Control pressure (gauge pressure)
t = Ambient temperature

C20

1. Test specifications

1.1 Control pressure "cold"

Part No. of warm-up regulator: 0 438 140 124
0 438 140 125

(Version for intake-manifold-pressure-controlled full-load enrichment).

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 400...600 mbar
(300...450 mmHg)

Test step	Test specifications+

D1

1.2 Control pressure "warm"

Part No. of warm-up regulator:
0 438 140 124
0 438 140 125

- Test at atmospheric pressure (without vacuum) 2,6...3,0 bar (2,7...3,1 kgf/cm²)
- For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value:
400...600 mbar
(300...450 mmHg) 3.4...3.8 bar (3.5...3.9 kgf/cm²)

1.3 Leak test on full-load diaphragm

Part No. of warm-up regulator:
0 438 140 124
0 438 140 125

Setting value:
400...600 mbar
(300...450 mmHg)

Maximum pressure drop: 100 mbar (75 mmHg) / 15 s

C1

1.4 Electric fuel pump

Fuel delivery: At least 950 cm³/30 s

D3

1.5 Primary pressure

Fuel distributor no.: 0 438 100 135

- Checking value: 5.1...5.8 bar (5.2...5.9 kgf/cm²)
- Setting value: 5.3...5.5 bar (5.4...5.6 kgf/cm²)

*Pressures are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

Test step	Test specifications*

1.6 Leak test — D16

Fuel accumulator no.	Minimum pressure after 10 min.	Minimum pressure after 20 min.
0 438 170 040	2.5 bar	2.4 bar
0 438 170 041	(2.6 kgf/cm²)	(2.5 kgf/cm²)

1.7 Injection valve — E11

Injection valve no.:

0 437 502 028	Opening pressure
0 437 502 029	3.0...4.1 bar (3.1...4.2 kgf/cm²)

1.8 Fuel distributor — E20

Comparative measurement of fuel deliveries.
Fuel distributor part number: 0 438 100 135

	Setting point	Max. allowable delivery
Idle	6.0 cm³/min.	6.7 cm³/min.
Part load	40.0 cm³/min.	43.0 cm³/min.
Full load	165.0 cm³/min.	180.0 cm³/min.

This full-load delivery must be reached at least when the air-flow sensor flap is fully deflected.

1.9 Idle adjustment — F8

For idle adjustment/checking: Switch on upper beam; switch off air conditioner. Engine at operating temperature, oil temperature approx. +80°C; radiator fan must not operate when adjusting. Overrun cutoff (if fitted) to be rendered inoperative. Disconnect crankcase breather hose from cylinder head cover and seal off end of hose.

*Pressures are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

Idle adjustment (continued)

F8

• Idle speed	
Air conditioner off	750...850 min^{-1}
Air conditioner on	850...950 min^{-1}
With idle actuator current:	
Air conditioner off	410...450 mA
Air conditioner on:	
Manually-shifted transmission	470...510 mA
Automatic	480...520 mA
• CO concentration	0.8...1.2 % by vol.

1.10 Overrun cutoff

F17

• Cutoff speed	> 1200 min^{-1}
• Idle throttle-valve switch switching point	1...2.5° throttle angle
• SAS valve	approx. 40...90 Ω

1.11 Idle speed stabilization

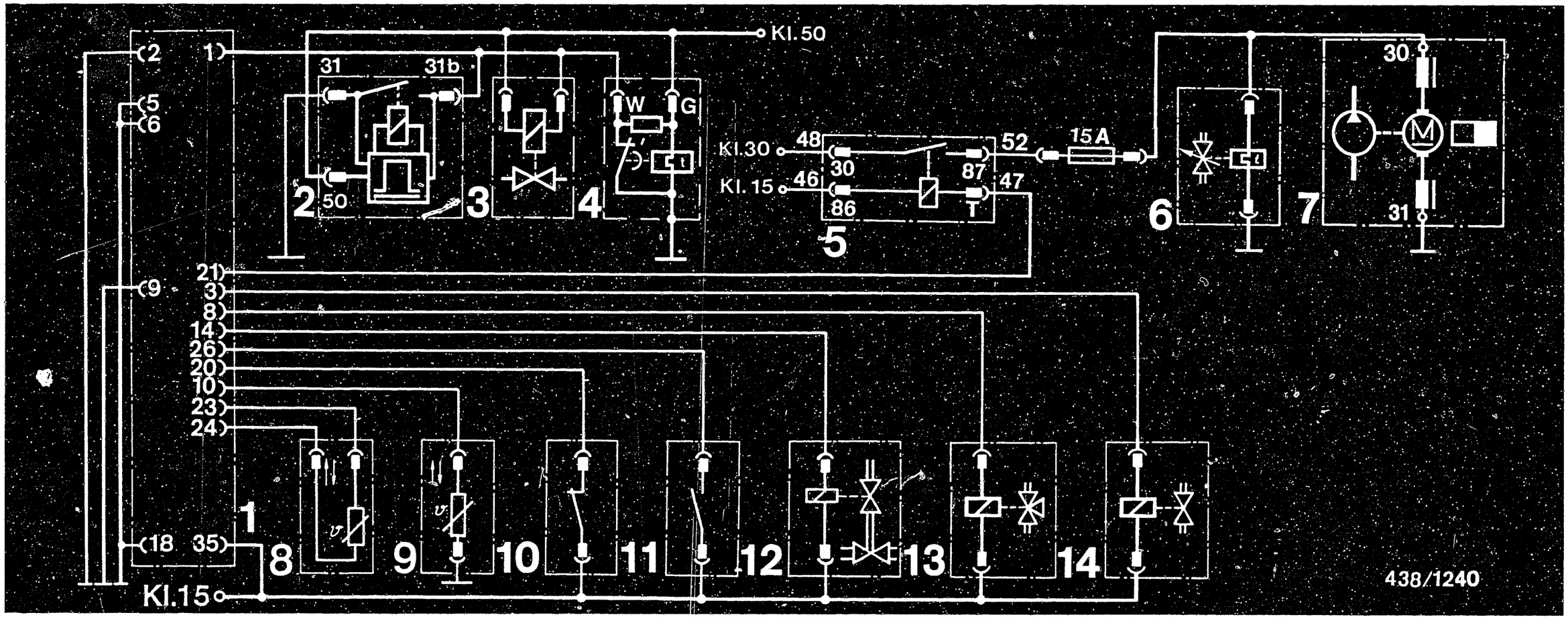
G12

• Thermo-switch	
closed	below +30°C
open	above +40°C

1.12 Potentiometer on air-flow sensor

G21

Total resistance	3000...5000 Ω
Idle resistance	500... 900 Ω
Full-load resistance	3500...6000 Ω

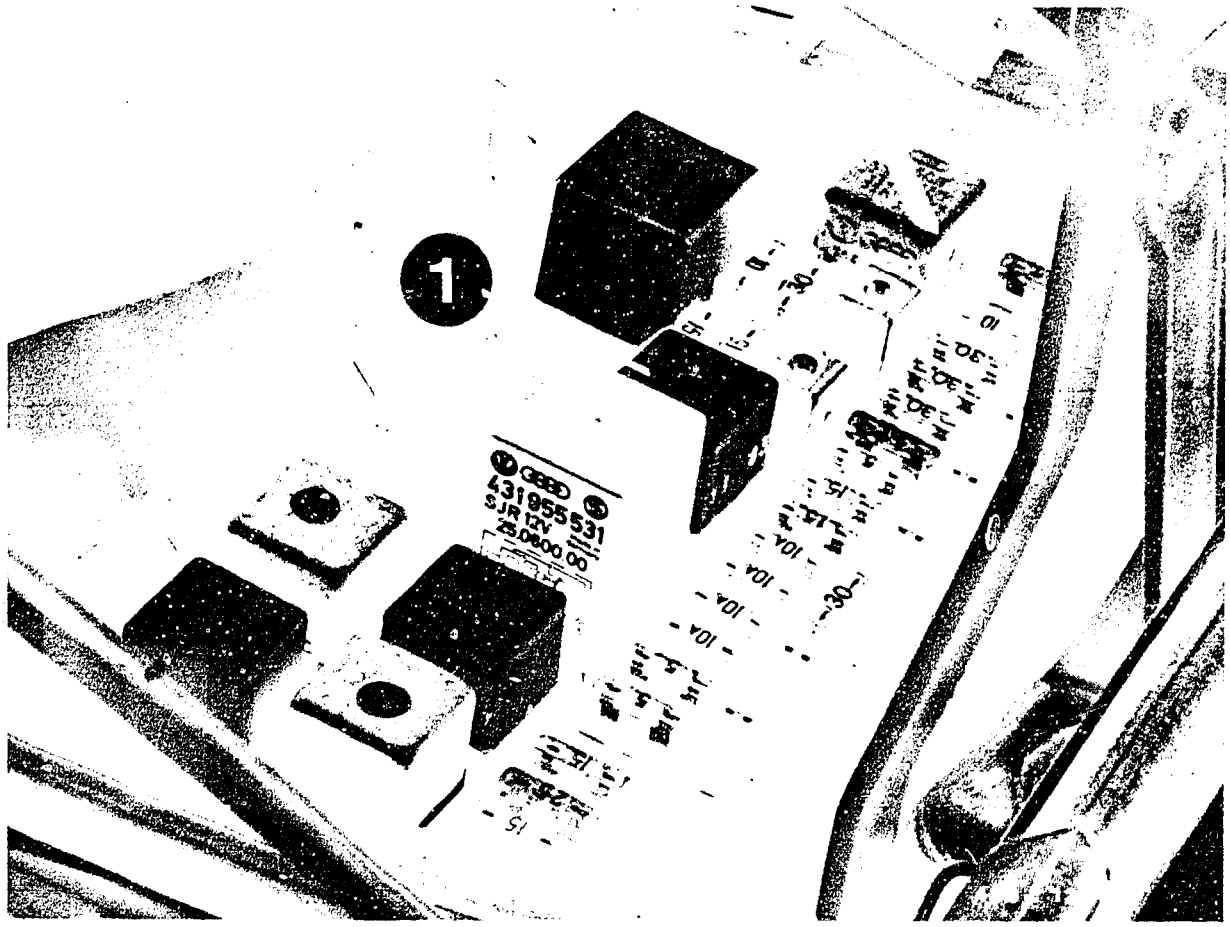


1 = Control unit for ignition and injection
2 = Time-pulse relay
3 = Start valve
4 = Thermo-time switch
5 = Injection relay
6 = Warm-up regulator
7 = Electric fuel pump
8 = "Air" temperature sensor
9 = "Engine" temperature sensor
10 = Idle throttle-valve switch
11 = Full-load throttle-valve switch
12 = Overrun cutoff valve
13 = 2-way valve for full-load control of warm-up regulator
14 = Exhaust-gas recirculation valve, only Sweden and Switzerland version with manually-shifted transmission

2. Electrical safety circuit with control unit for ignition and injection

2.1 Circuit diagram

The safety circuit with injection relay (5) is energized from terminal 21 of the control unit (not made by Bosch). The following functions are likewise triggered from the control unit: Full-load enrichment (11 and 13), overrun cutoff (10 and 12) and exhaust-gas recirculation (14).



1 = Injection relay in central-electrics console

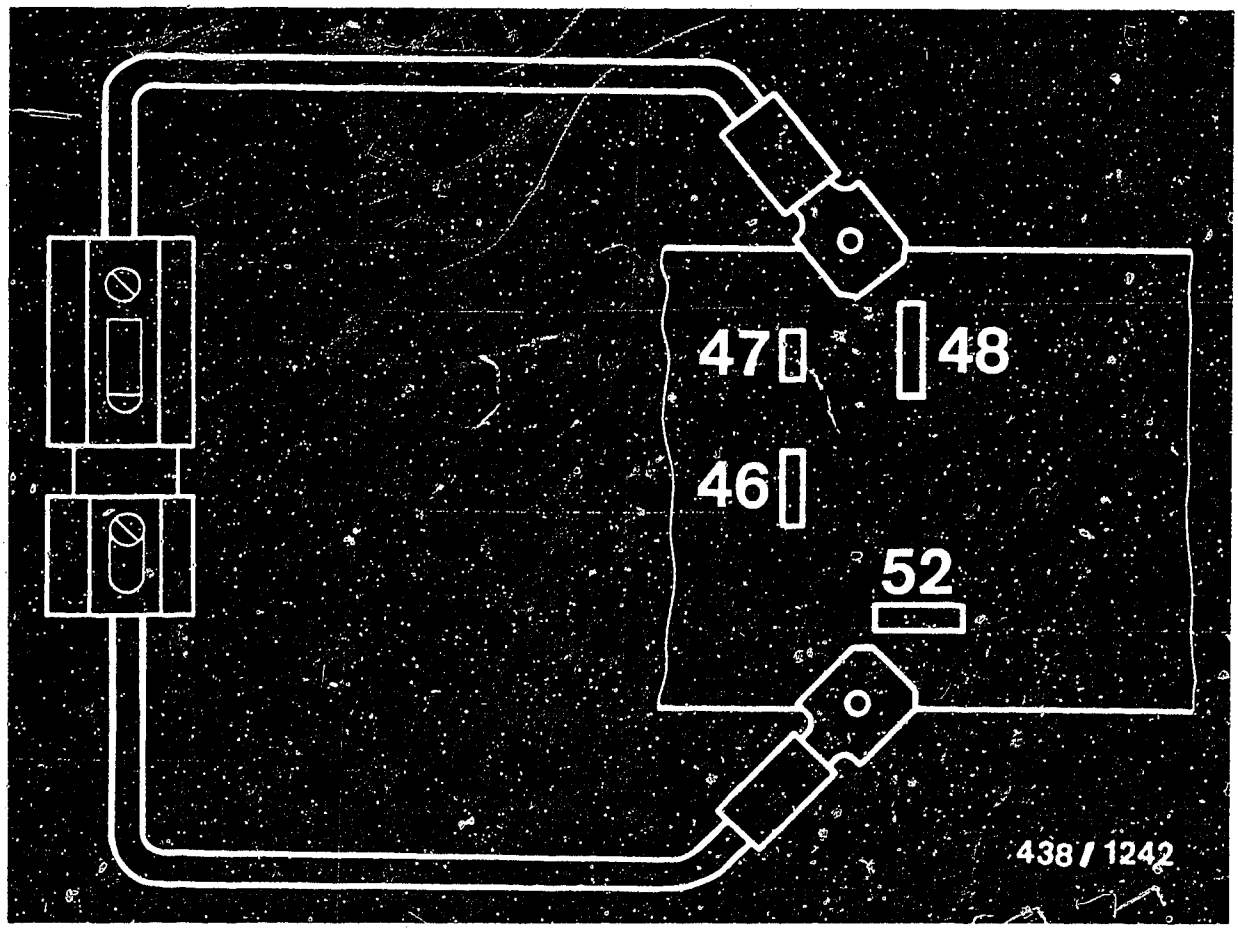
The control unit for ignition and injection is mounted in the front passenger footwell behind a cover on the right-hand side wall.

2.2 Hot starting

Whenever hot-starting, the start valve is energized by a time-pulse relay and injects extra fuel intermittently into the intake manifold.
When cold-starting, this function is superimposed by the thermo-time switch.

2.3 Bridging the safety circuit

To carry out testing operations with the engine stationary, it is necessary to bridge the safety circuit. To do this, pull the injection relay (in central-electrics console in engine compartment on left in front of windshield) out of the relay board.



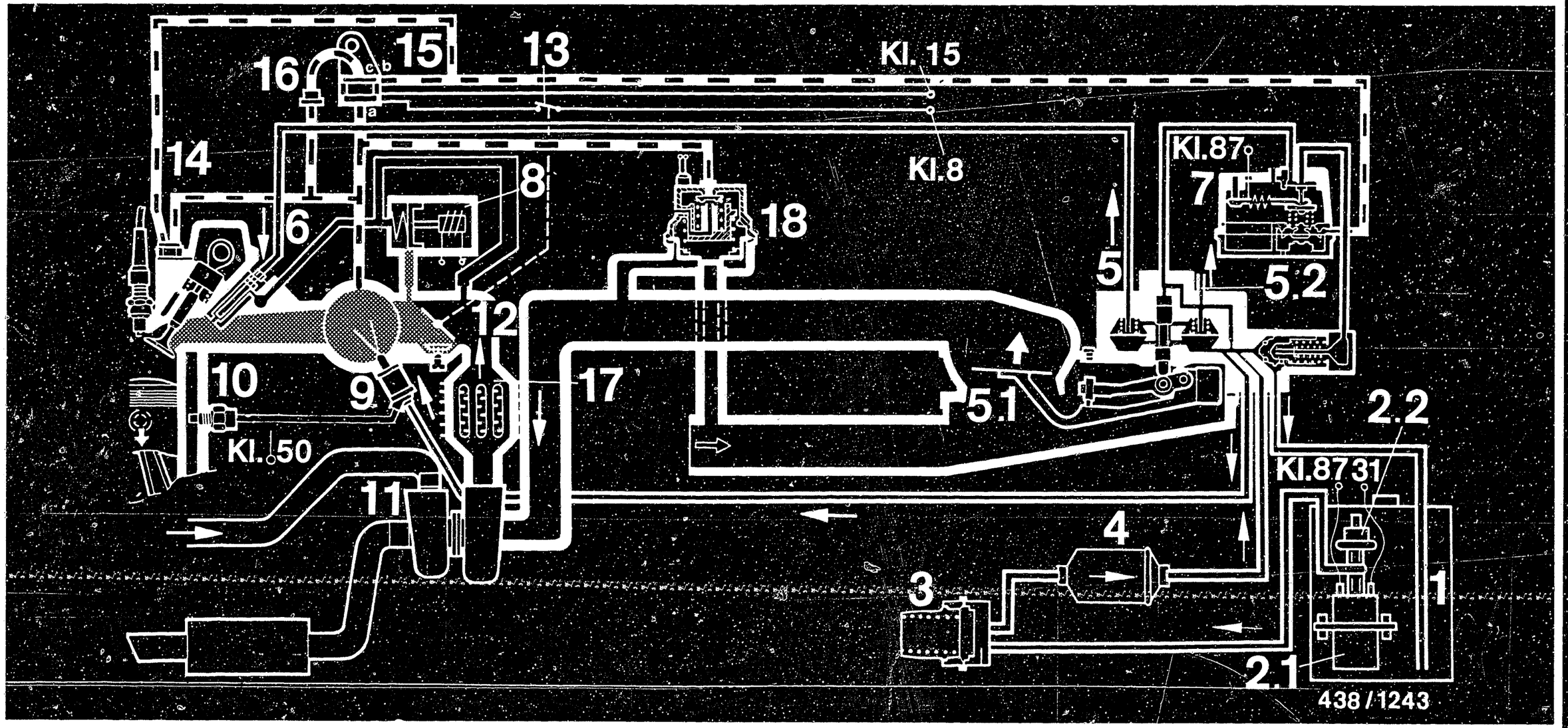
Connect contacts 30 and 87 in the base with a bridge.

Use connecting cable 1.5 mm^2 with fuse holder and 16 A fuse (to be user-fabricated according to sketch),

Electric fuel pump, warm-up regulator and auxiliary-air device are now supplied with battery voltage.

CAUTION!

Never deflect (raise) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.



3. Diagram of fuel lines

Fuel lines

Manifold-pressure lines

1 = Fuel tank
2.1 = In-tank electric fuel pump
2.2 = Pressure damper
3 = Fuel accumulator
4 = Fuel filter
5 = Mixture-control unit
5.1 = Air-flow sensor
5.2 = Fuel distributor
6 = Injection valve
7 = Warm-up regulator
8 = Idle actuator
9 = Start valve
10 = Thermo-time switch
11 = Turbocharger
12 = Throttle valve
13 = Throttle-valve switch
14 = Thermopneumatic valve
15 = 2-way valve
16 = Non-return valve
17 = Charge-air cooler
18 = Overrun cutoff valve

4. General information

4.1 Introduction

The Audi 200/5 T has been available in the Europe version since 9.1983 with 2.2 l/5-cylinder turborcharged engine with K-Jetronic.

These repair instructions refer only to the above-mentioned vehicle and describe in concise form the testing and adjustment operations which are to be performed on the vehicle on the K-Jetronic.

This repair manual refers only to the above-mentioned vehicles and gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.

All the system components are dealt with in separate working steps with the corresponding test specifications. In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

4.2 Design

The entire system of the K-Jetronic in these vehicle models corresponds, with the exception of the differences listed below, to the basic design as described in Technical Instruction VDT-U 3/1 En.

4.3 The following components are different or extra:

- Intank electric fuel pump with replaceable non-return valve and screwed-on pressure damper for noise reduction.
  The completely assembled unit is latched inside into the base of the fuel tank.
  The electric fuel pump is accessible through a closure ring on the top side of the fuel tank.

- 5-cylinder mixture-control unit with updraft air-flow sensor.
  In some cases, with angle sensor (potentiometer) for fuel consumption indicator.

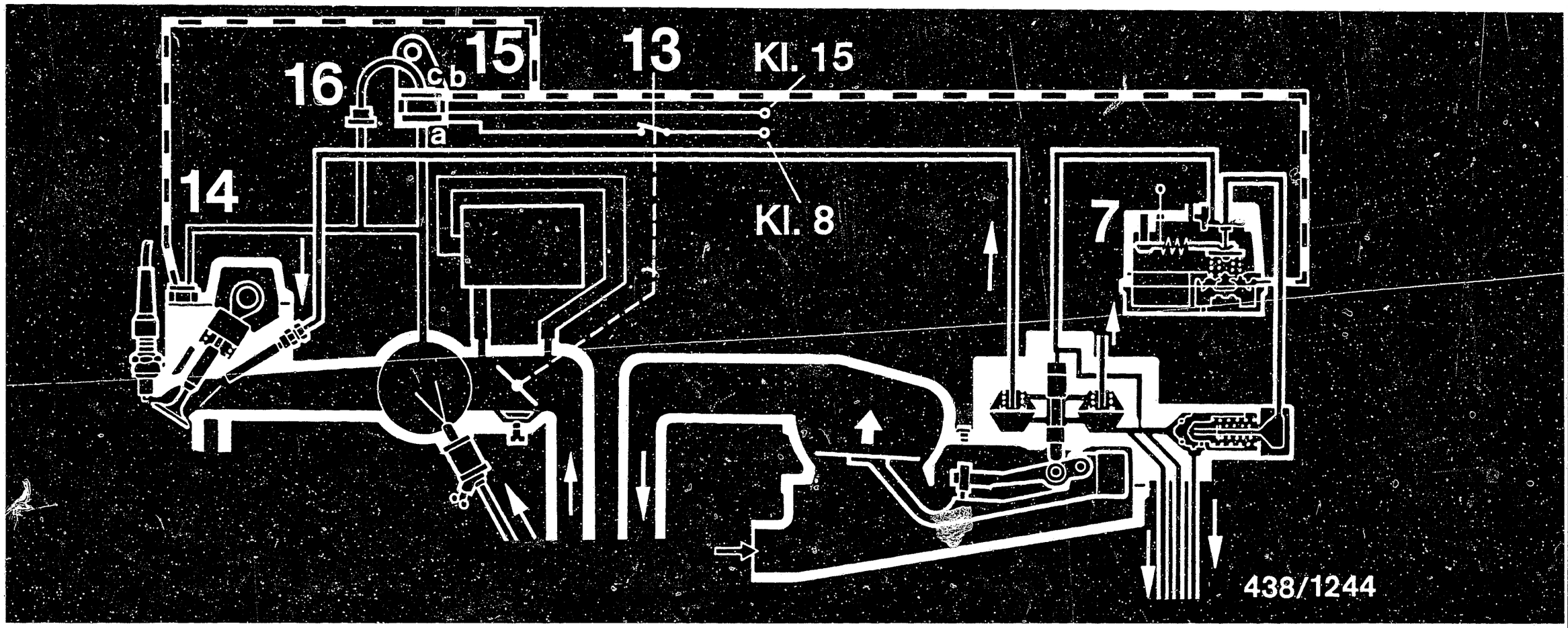
- Warm-up regulator for manifold-pressure-controlled full-load enrichment.
  Control-pressure reduction at full load.
  Manifold-pressure connection on intermediate plate.

- Air-shrouded injection valve for improved mixture formation particularly at idle.
  Air distribution takes place in cylinder head.

- No auxiliary-air device, replaced by idle actuator for idle speed stabilization (not made by Bosch). Operating principle similar to Bosch idle-speed control).
- Temperature- and engine-speed-dependent overrun cut-off as standard in vehicles with manually-shifted transmission. Electrically energized by throttle-valve microswitch and control unit for ignition and injection.
- Electrical safety circuit for electric fuel pump and warm-up regulator by means of injection relay, energized by control unit.
  Consequently, with the engine stopped and the ignition on, the electric fuel pump is prevented from starting and the warm-up regulator is prevented from shutting off prematurely.
- Exhaust turbo-supercharger between air-flow sensor and throttle valve.
- Blow-off valve for controlling the turbocharger.
- Charge-air cooler after turbocharger for increasing power.
- Auxiliary blower for cooling the injection valves. The blower motor is controlled by a thermo-switch.

Cut-in temperature:	+ 100° ± 4°C
Cut-out temperature:	+ 94° ± 4°C

- Whenever hot-starting, the start valve is energized by a time-pulse relay and injects extra fuel intermittently into the intake manifold.
  When cold-starting, this function is superimposed by the thermo-time switch.



• Warm-up regulator for intake-manifold-pressure-controlled full-load enrichment 0 438 140 124/125.

Engine cold:
At engine temperatures below 58 ± 3°C, vacuum path from intake manifold through open thermopneumatic valve (14) to warm-up regulator (7). Non-return valve (16) is closed. At full load (no vacuum) mixture enrichment is through control-pressure reduction.

Engine warm:
At engine temperatures above 58 ± 3°C, vacuum path from intake manifold through open non-return valve (16) and open two-way valve (15) (connection between c and b) to warm-up regulator. The non-return valve closes at full load.
The opening of the throttle-valve switch (13) causes the two-way valve to switch (connection between a and b).
Air is supplied to the warm-up regulator for mixture enrichment.

5. Test equipment and tools

- Pressure tester KDJE-P 100 (previously KDEP 1034).
  For testing all fuel pressures and testing for leaks.

- Connecting-parts set KDJE-P 100/12 (previously KDEP 1034/12).
  For connecting pressure tester to the control-pressure port of the fuel distributor.

- Adjusting wrench KDEP 1035.
  For adjusting the idle-mixture-adjusting screw in the mixture-control unit (CO-adjustment).

- Guide ring KDEP 1040/10 (dia. 80 mm)
  For centering the air-flow sensor plate in the air-flow sensor.

- Tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).
  For comparing the fuel delivered from the individual fuel-distributor outlets.

- Graduate (commercially available, capacity approx. 1.5 l)
  For measuring the delivery of the electric fuel pump.

- Electric connecting cable (test lead).
  KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.

- Tool set for fitting and removing the idle CO anti-tamper device of air-flow sensor.
  (e.g. No. 4521/7 from Hazet, 5630 Remscheid).

- Multimeter, Ri ≧ 20 kΩ/V, commercially available

- Angle measuring device KDJE-7462
  For adjusting the idle throttle-valve switch.

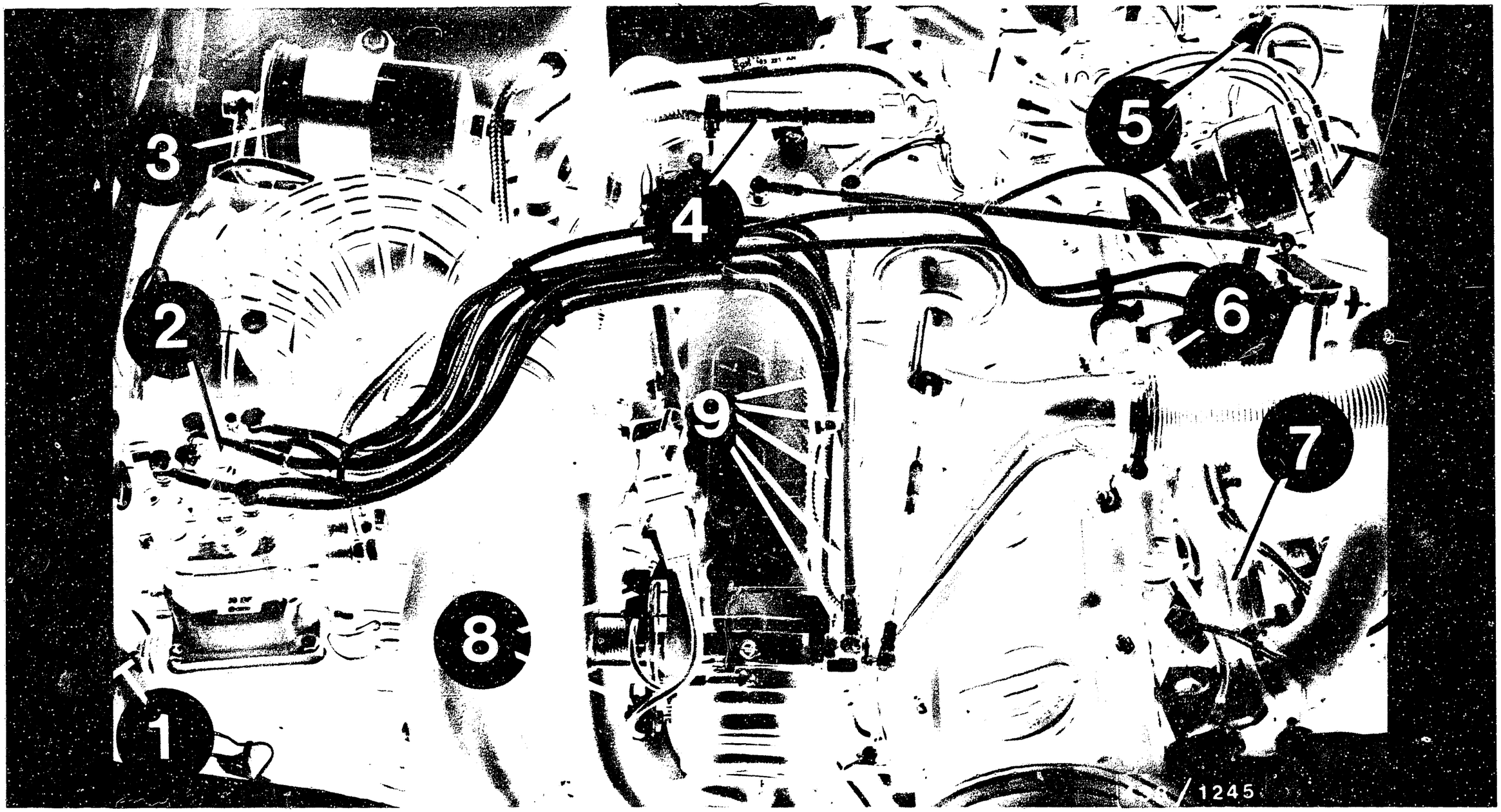
- Valve tester KDJE-P 400 (previously KDJE 7452).
  For testing the injection valves.

  Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135) or
  Bosch, Part Designation VS 14942-CH
  Previously Part No. 5 973 340 650
  The Bosch calibrating fluid can be obtained in 5 l metal cans from the following supplier:
  Firma
  Oskar Gnamm GmbH & Co
  D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.

- Tachometer (commercially available)
  For idle-speed adjustment.
- CO meter (commercially available)
  For idle-speed CO adjustment.
- Vacuum pump (commercially available)
  For testing the warm-up regulators with full-load enrichment dependent on intake-manifold pressure, e.g. the vacuum hand-operated pump from

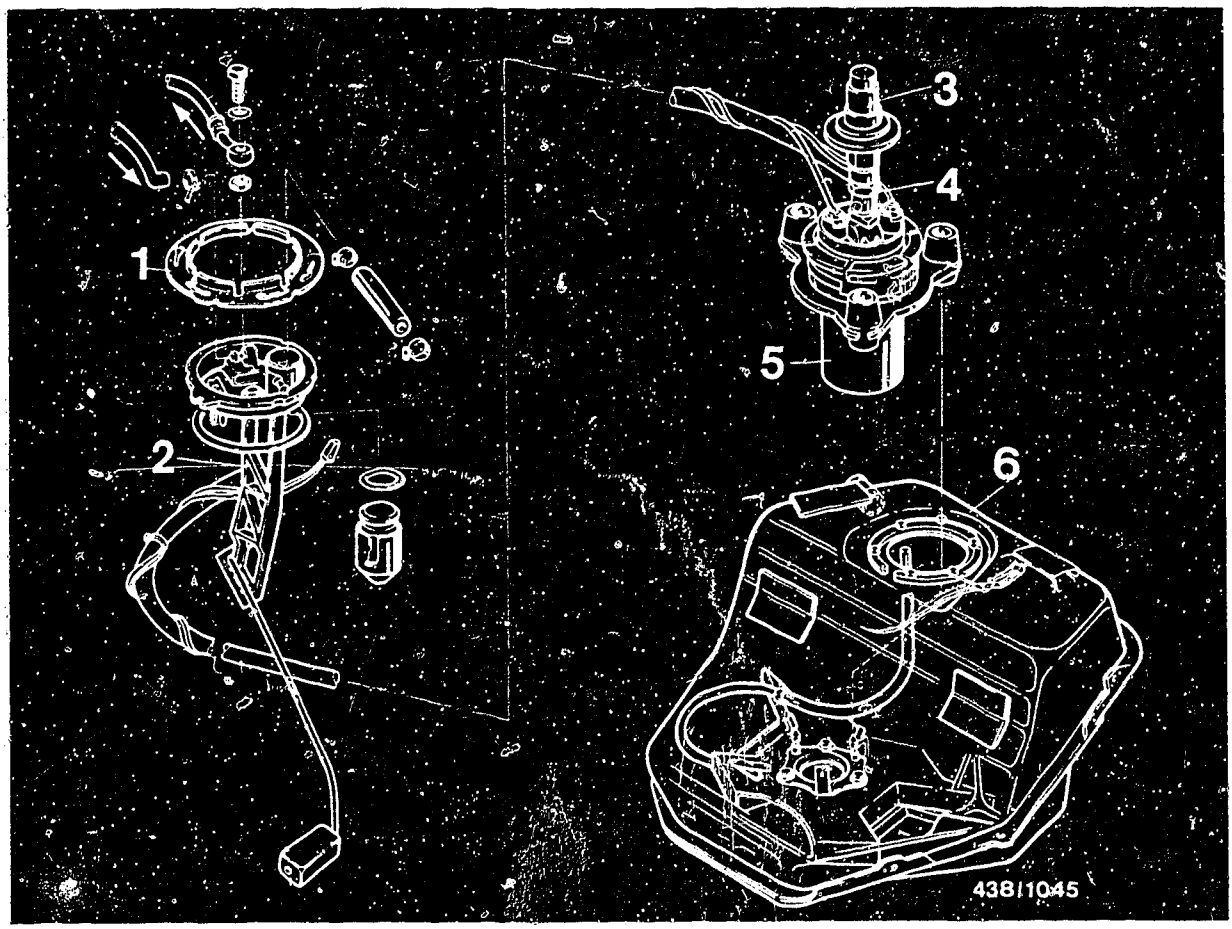
  Firma Korinth
  Ludwig-Kloos-Strasse 21
  6450 Hanau 7 (Steinheim)



1 = Overrun cutoff valve (concealed behind the right-hand side wall)
2 = Mixture-control unit
4 = Idle actuator
5 = 2-way valve
6 = Auxiliary blower for injection valves
7 = Warm-up regulator
8 = Idle and full-load throttle-valve switch
9 = Injection valves

6. Installation position of individual components

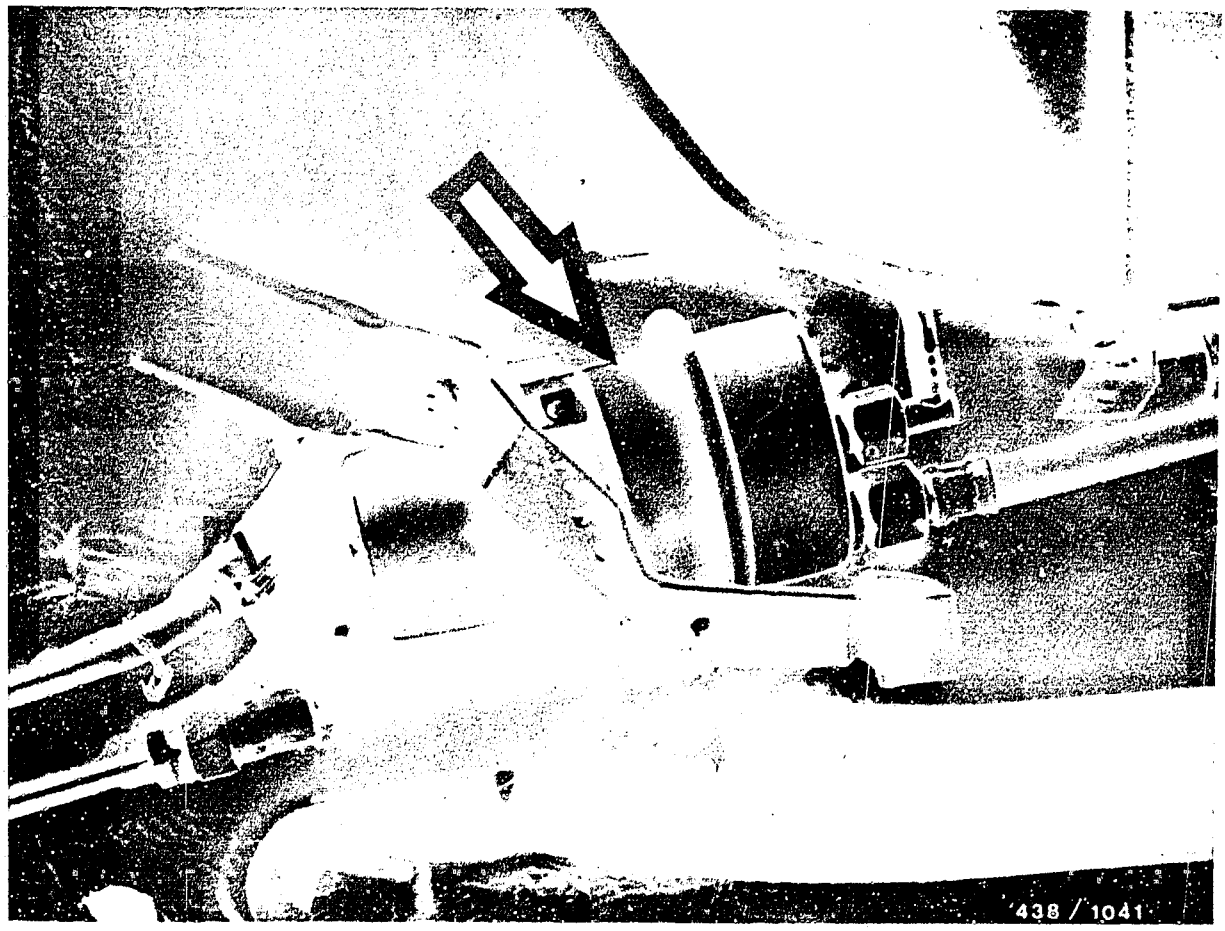
6.1 Arrangement of components on engine



1 = Closure ring
2 = Fuel tank sender
3 = Pressure damper
4 = Non-return valve
5 = Electric fuel pump
6 = Fuel tank

6.2 Fuel-supply components

The intank electric fuel pump with replaceable non-return valve and screwed-on pressure damper is accessible through the closure ring on the top side of the fuel tank.



The fuel accumulator (arrow) is mounted by means of a bracket on the vehicle underside, to the right in front of the fuel tank.

The connections must be cleaned thoroughly before replacing the fuel accumulator.

7. Trouble-shooting

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order, and that the engine and turbocharger are mechanically O.K.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B 2 - B 5 is intended to make it easier to decide which test steps have to be performed for certain faults.

According to the symptom stated by the customer or which you have determined yourself, select the possible cause in the trouble-shooting chart. The Coordinates at the end of the cause column refer to the appropriate test step with the associated test specification.

Important note:
If any fuel connections are loosened, parts removed (also on the vacuum system), always use new seals when reconnecting or when re-installing.

Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.

Trouble-shooting charts (see also coordinates B4/B5)

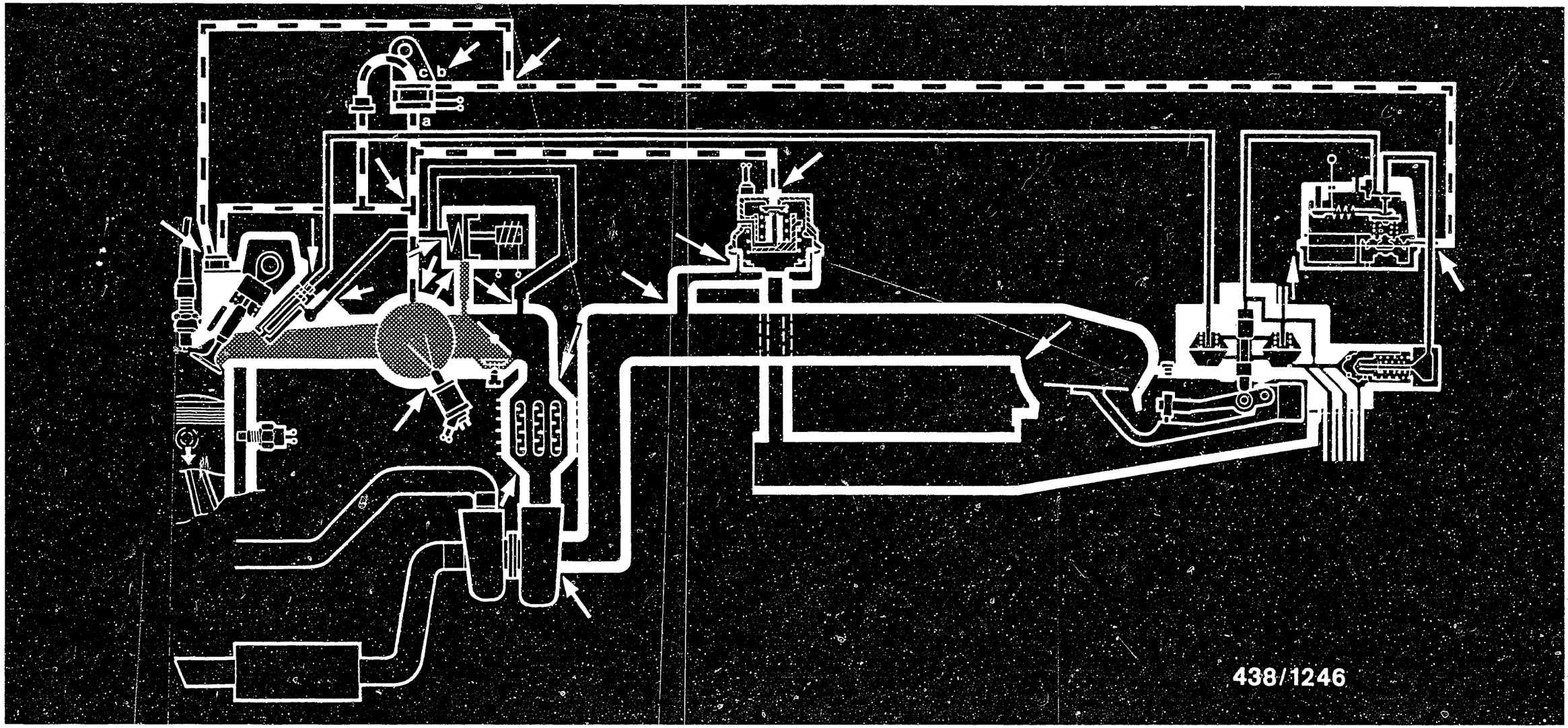
Customer complaint (fault symptom)

1. Engine does not start, or starts poorly, in cold condition	2. Engine does not start, or starts poorly, in warm condition	3. Irregular idling during the warm-up phase (shakes)	4. Irregular idling with warm engine (shakes)	5. Engine does not draw gas, burbles	6. Engine misfires when operatin on the road, high load	7. Insufficient power	Cause	Coordinates
	●	●	●	●		●	Vacuum system leaking	B 6
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 9
	●						Position of the air-flow sensor plate incorrect	B 19
●		●					Idle speed stabilization not O.K.	G 12
	●	●	●	●		●	Overrun cutoff not O.K.	F 17
●	●				●		Electric fuel pump not operating	C 1
●	●						Cold-start system defective, impulse relay defective	C 6
		●	●				Cold-start valve leaking	C 8
				●			Excessive fuel delivery for control-pressure circuit	C 11
●		●					"Cold" control pressure outside tolerance	C 20
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	D 1
			●	●		●	"Warm" control pressure too low (after warm-up)	D 1
					●	●	Primary (system) pressure outside tolerance	D 8
	●						Overall fuel system leaking	D 16
●	●	●	●		●		Injection valves leaking, opening pressure too low	E 11
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	E 20
●	●	●	●	●			CO basic setting incorrect	F 11
						●	Trottle plate does not open completely	--
						●	Turbocharger or charge-air pressure regulator defective	--

8. Engine runs on ("diesels")	9. Fuel consumption too high	10. Flat spot during acceleration	11. CO concentration at idle too high	12. CO concentration at idle too low	13. Idle speed not adjustable (too high)	14. Engine starts, but stops again immediately	15. Fuel consumption indication incorrect	Cause	Coordinates
		●		●				Vacuum system leaking	B 6
●		●	●	●				Air-flow sensor lever/control plunger stiff	B 9
●								Position of air-flow sensor plate incorrect	B 19
					●			Idle speed stabilization not O.K.	G 12
	●	●		●		●		Overrun cutoff not O.K.	F 17
						●		Electric fuel pump not operating	C 1
●	●		●					Start valve leaking	C 6
		●				●		Fuel delivery for control-pressure circuit too great	C 11
		●				●		Control pressure "warm" (warm-up regulator shut off) too high	D 1
	●	●	●			●		Control pressure "warm" (warm-up regulator shut off) too low	D 1
		●				●		Primary pressure outside tolerance	D 8
●								Injection valves leaking, opening pressure too low	E 11
		●						Imbalance of fuel deliveries (dispersion of deliveries)	E 20
●	●	●	●	●				CO basic adjustment incorrect	F 11
							●	Angle sensor (potentiometer) on air-flow sensor not O.K.	G 21
							●	Trip computer/indicator instrument (not made by Bosch) not O.K.	---

B4 Trouble-shooting chart
Audi 200/5 T 9.83 →

B5 Trouble-shooting chart
Audi 200/5 T 9.83 →



Test steps

8. Checking the air intake system of the engine for leaks

The arrows in the picture show typical points at which leaks may occur.
Perform a visual inspection or, if unsure, proceed as follows: Remove the hose from the outlet of the auxiliary-air device and using a compressed-air gun, blow air through this hose into the intake system. Open the throttle valve fully while doing this.
Brush joints with soapy water or spray with leak-detector spray (e.g. Güpoflex).
Under no circumstances may combustible liquids be used for the leak test.

Bubbling or foaming indicates a leak.

Pay particular attention to the O-rings and insulating sleeves of the injection valves when testing for leaks. If necessary, change the O-rings (part no. 3 430 210 600) or tighten the insulating sleeves with a hexagon-socket-screw key (AF = 11 mm).

When a leak has been remedied, carry out the idle adjustment with the engine at normal operating temperature.

Idle adjustment is described on coordinates F8.

9. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

9.1 Preparations

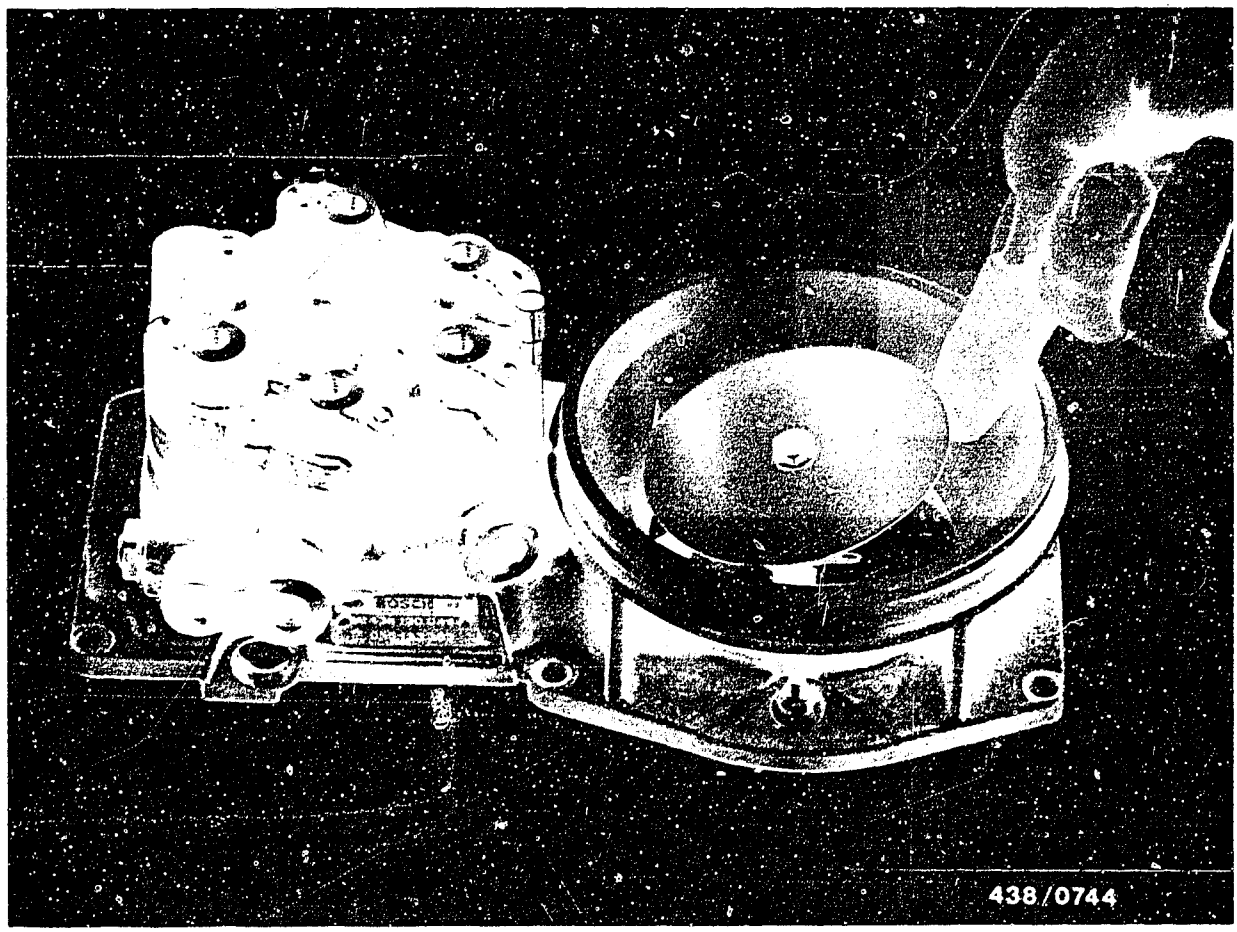
- Engine temperature not below +20 °C.

- Remove the rubber hood (release 2 clamping brackets) so that the air-flow sensor plate becomes accessible.

- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

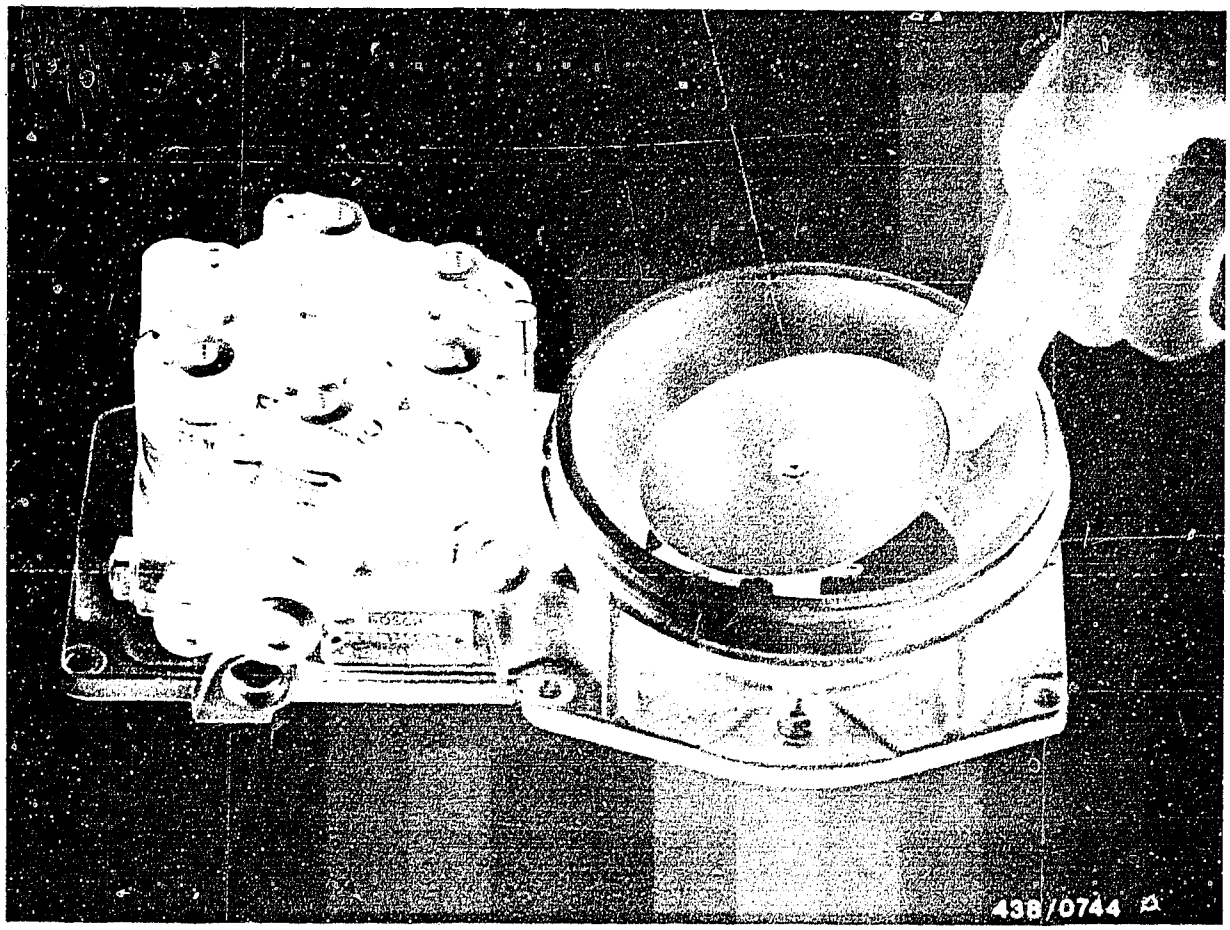
Caution!

Never deflect (raise) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.



9.2 Check that the control lever moves freely

Raise the air-flow sensor plate by hand (updraft) and release again. The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop. If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem.
If the problem is solved by loosening the fastening screws, the seal between the air-supply housing and air-flow sensor should be changed (Peugeot parts).
Tighten the screws uniformly cross-wise to a torque of 9...10 Nm (0.9...1.0 kgfm).
If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



9.3 Check that the control plunger moves freely.

Raise the air-flow sensor plate by hand (updraft). The same resistance must be felt over the entire movement.

Move the sensor plate rapidly back to a position just in front of the zero stop.

The control plunger follows only sluggishly, but must make noticeable contact with the sensor plate lever. If this condition is fulfilled, the control plunger can be considered to move freely.

If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

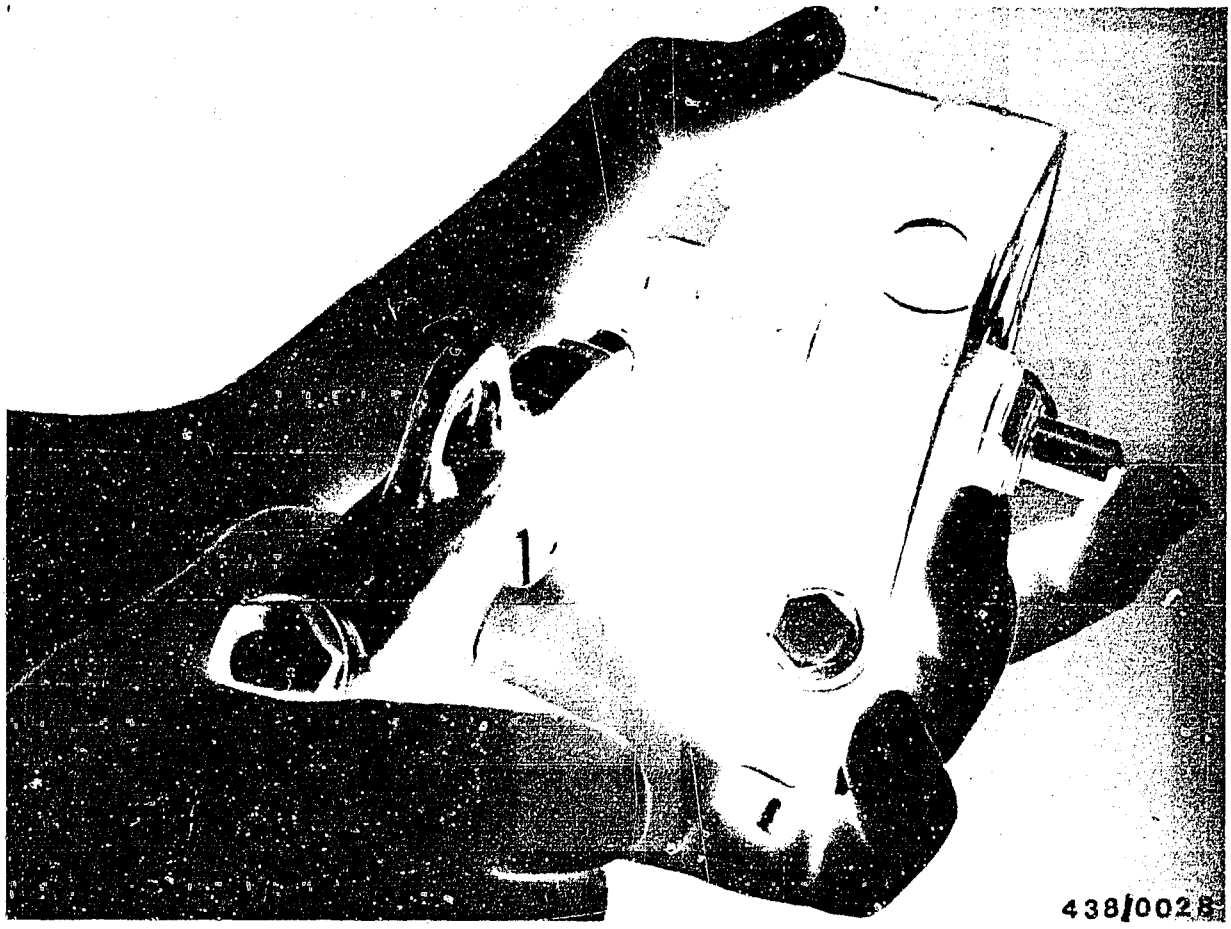
Important!

Note the following when installing fuel components and fuel lines:

Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.

When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.

Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.

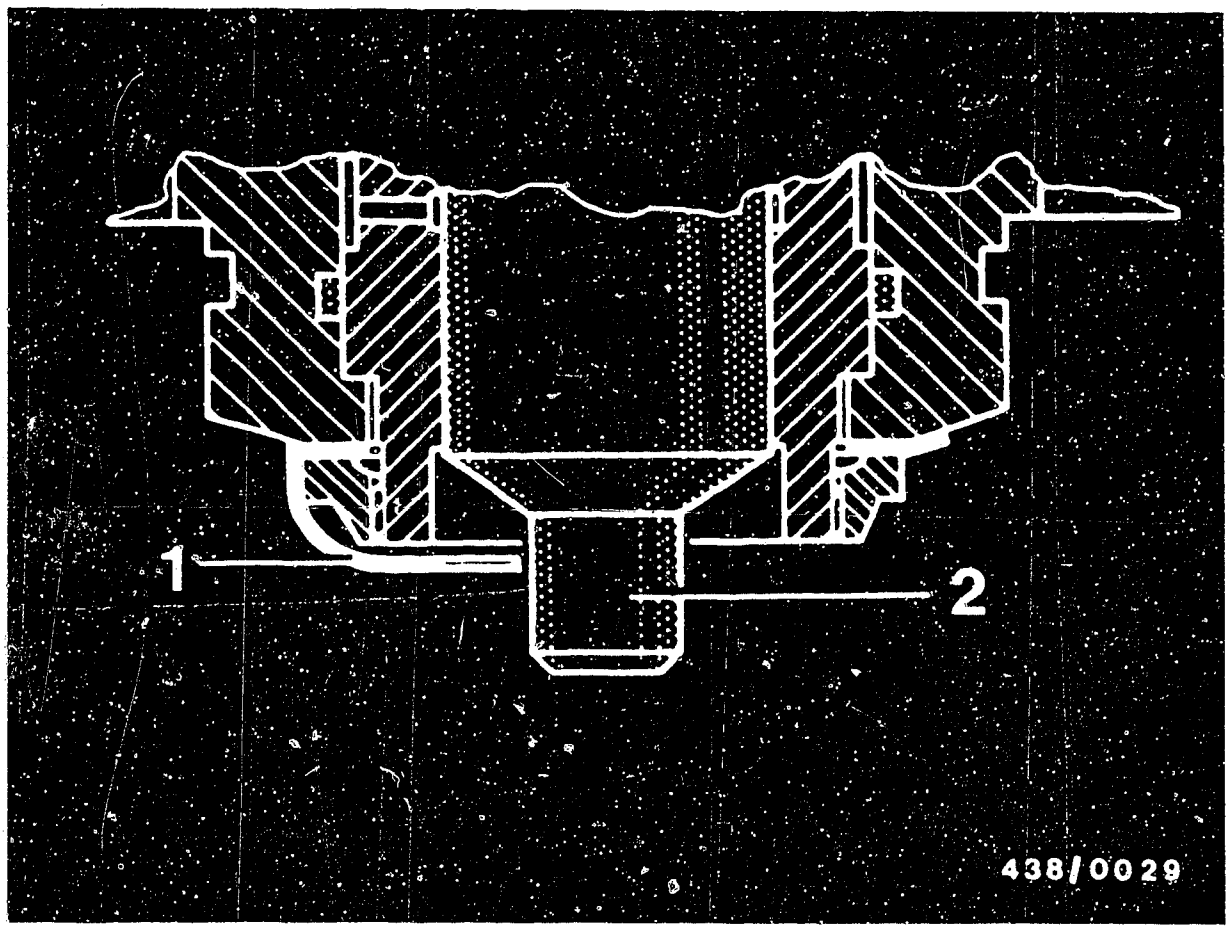


Unscrew three fastening screws and remove fuel distributor from air-flow sensor.

Remove control plunger. It may be necessary to blow compressed air very briefly through the control pressure connection port in order to remove the control plunger Hold control plunger with your hand while doing this. Thoroughly wash control plunger with benzine. If this does not result in the required freedom of movement, replace fuel distributor.

Note:

The fuel distributors are additionally equipped with a compression spring above the control plunger and a drop-out safeguard.
When removing the control plunger, first of all bend up the drop-out safeguard, paying attention to the compression spring, and re-insert the compression spring when assembling.



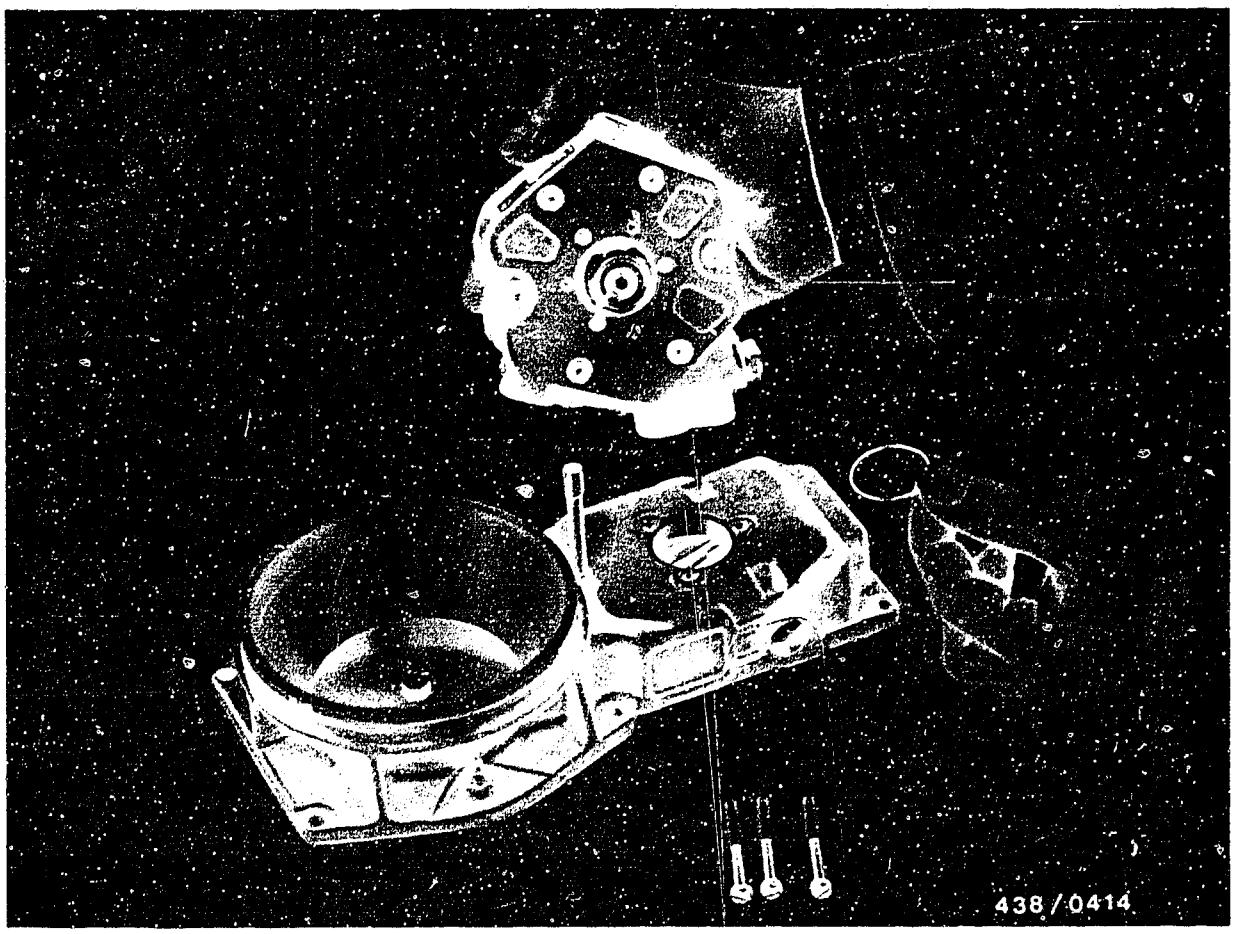
1 = Anti-drop-out device
2 = Control plunger

9.4 Fuel distributor with anti-drop-out device for the control plunger

Note:

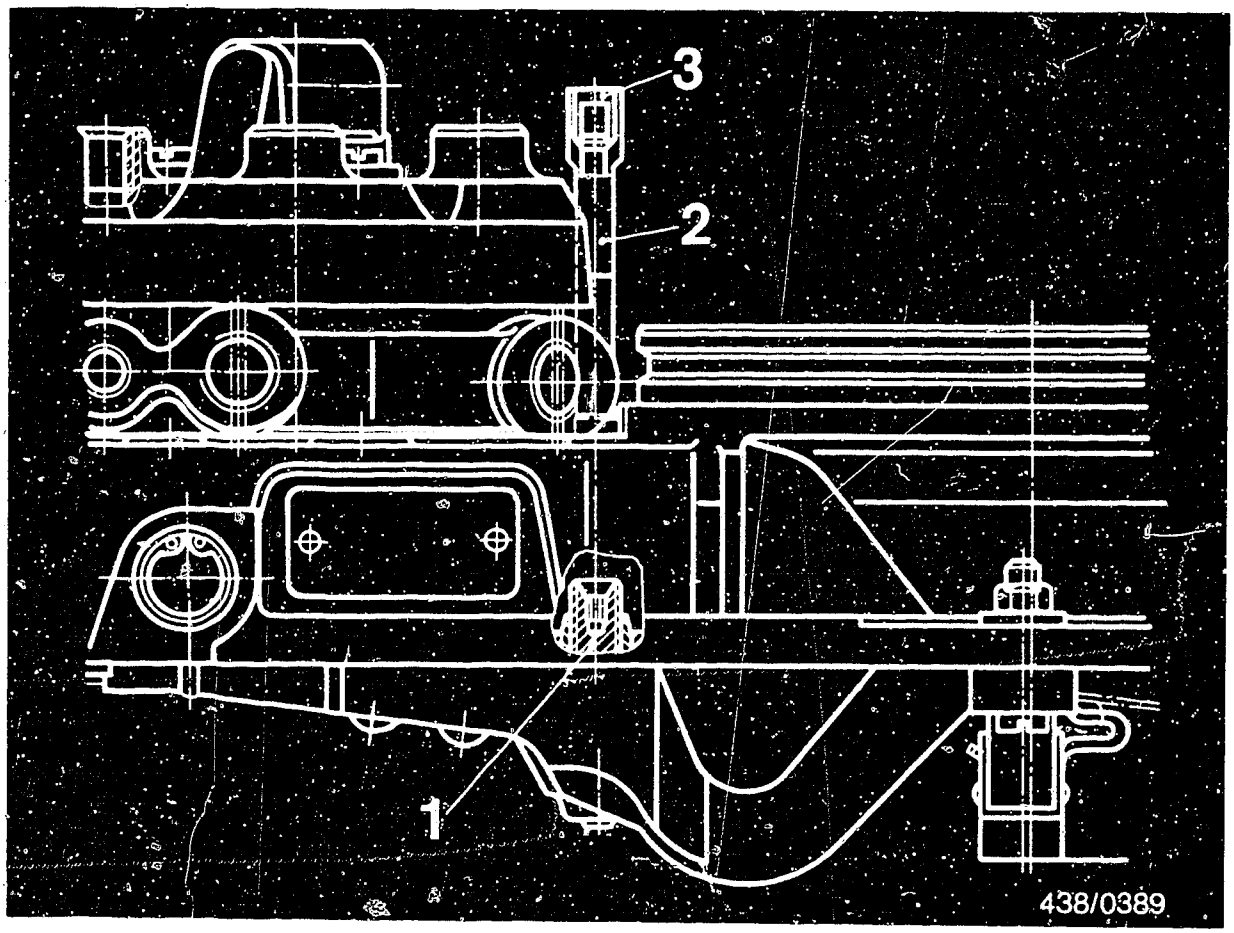
The fuel distributors have an anti-drop-out device for the control plunger.
This also protects the plunger in transit and facilitates installation.

The anti-drop-out device must not be removed!



9.5 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor.
Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.
When connecting the fuel-injection tubing, use new seal rings.

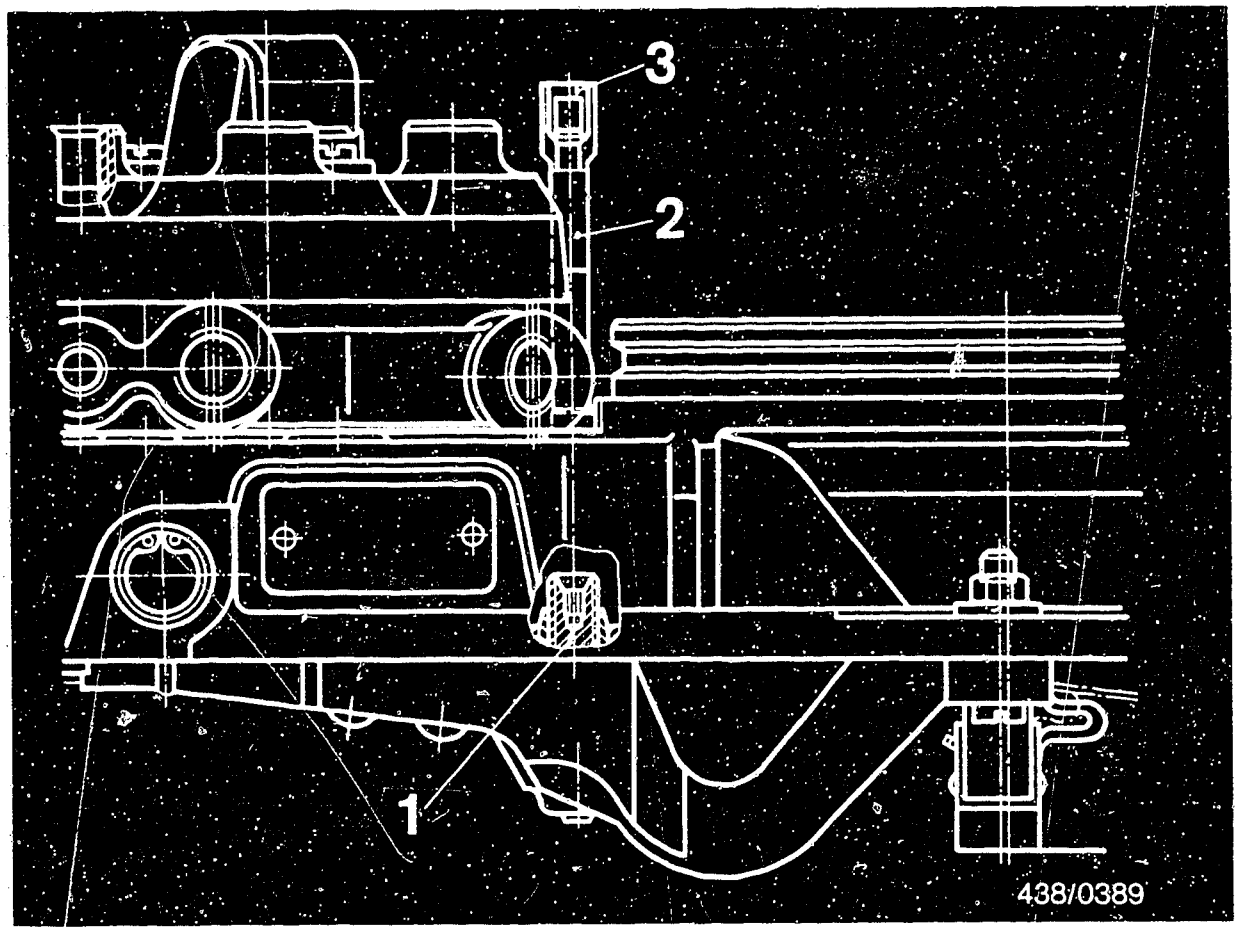


1 = Mixture-control screw
2 = Guide tube
3 = Lead seal

9.6 Matching the fuel distributor to the air-flow sensor for initial starting

Screw off one fuel-injection line from the fuel distributor.
Bridge the electrical safety circuit so that the electric fuel pump operates.

The idle-mixture-adjusting screw is adjusted via a guide tube rigidly fitted on the mixture-control unit.

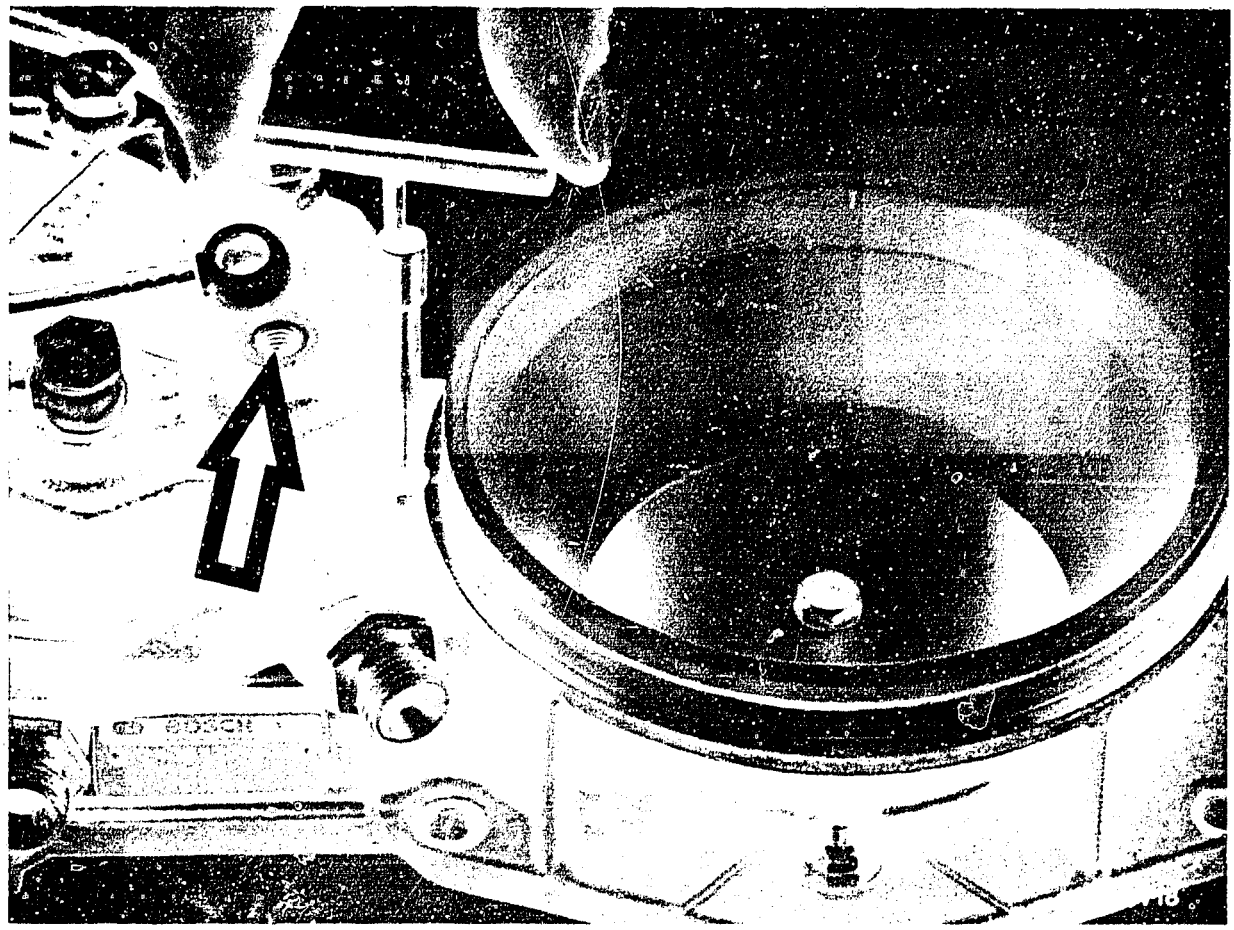


1 = Idle-mixture-adjusting screw
2 = Guide tube
3 = Lead seal

Remove anti-tamper device (lead seal) of the idle-mixture-adjusting screw. Introduce adjusting wrench KDEP 1035 through the hole into the idle-mixture-adjusting screw.

CAUTION!

Never deflect (raise) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.



Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the idle-mixture screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

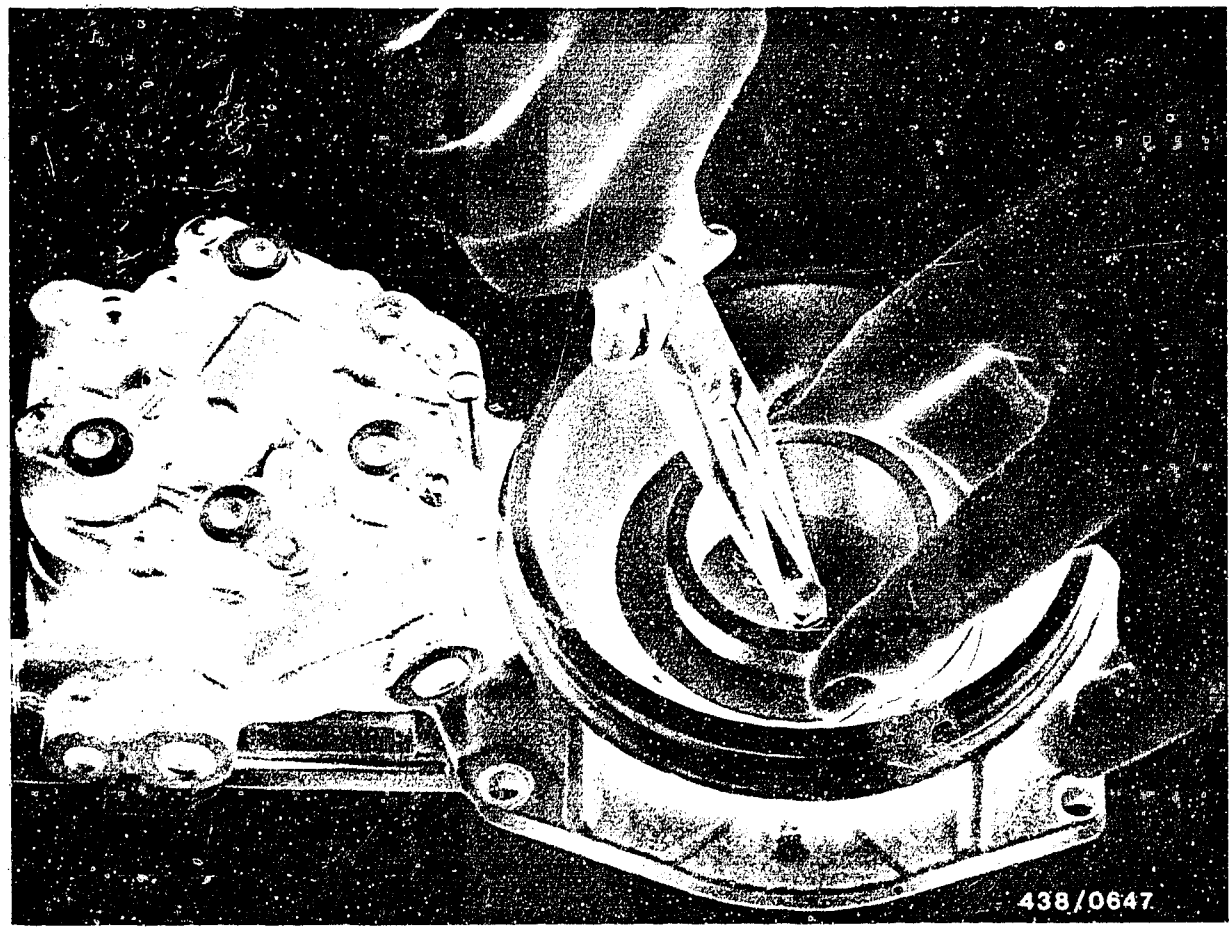
The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F 8.

10. Checking and adjusting the position of the air-flow sensor plate

10.1 Preparations

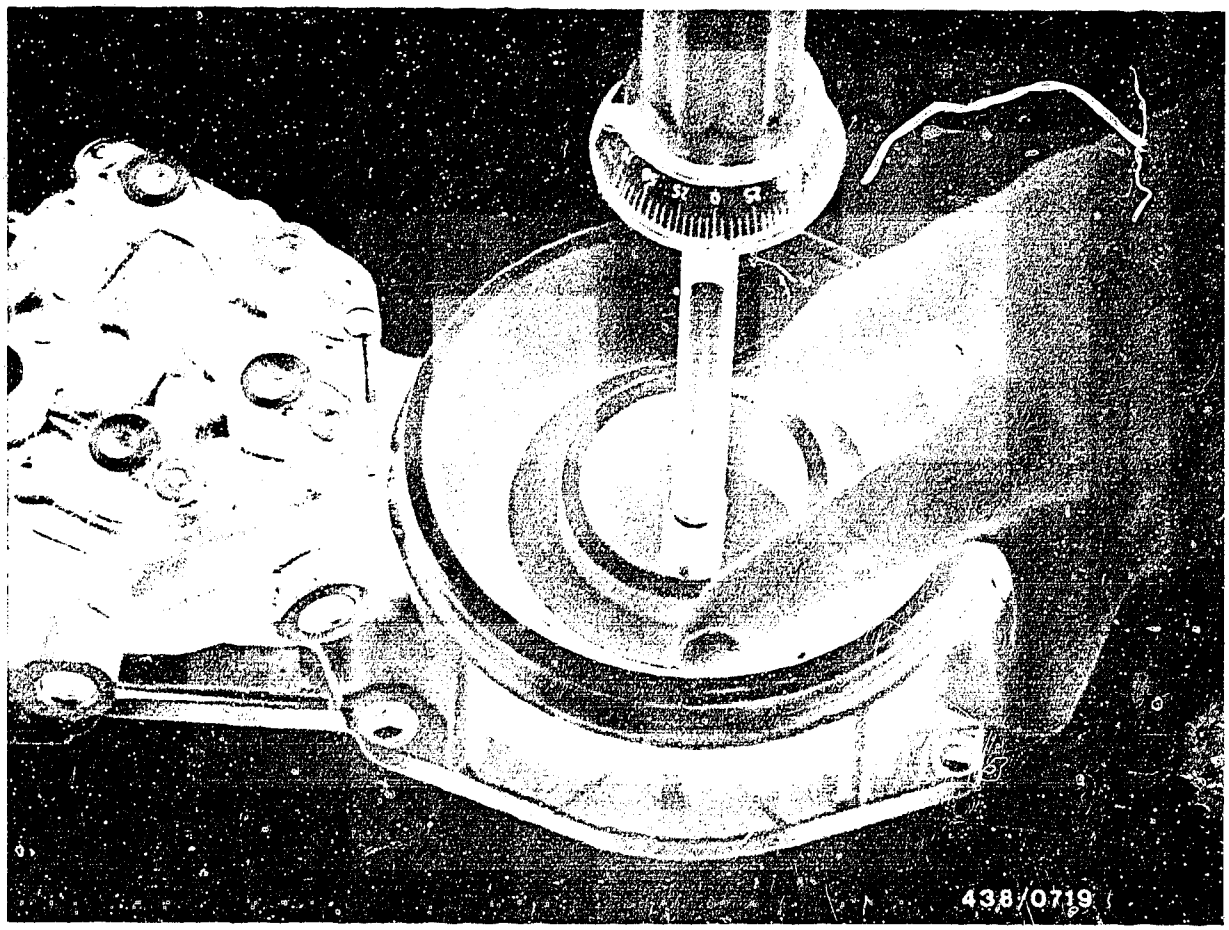
- Engine temperature is not important.
- Remove the rubber hood fitted between the air-flow sensor and the throttle-valve assembly (release 2 clamping bands), so that the air-flow sensor plate becomes accessible.



10.2 Centering the air-flow sensor plate

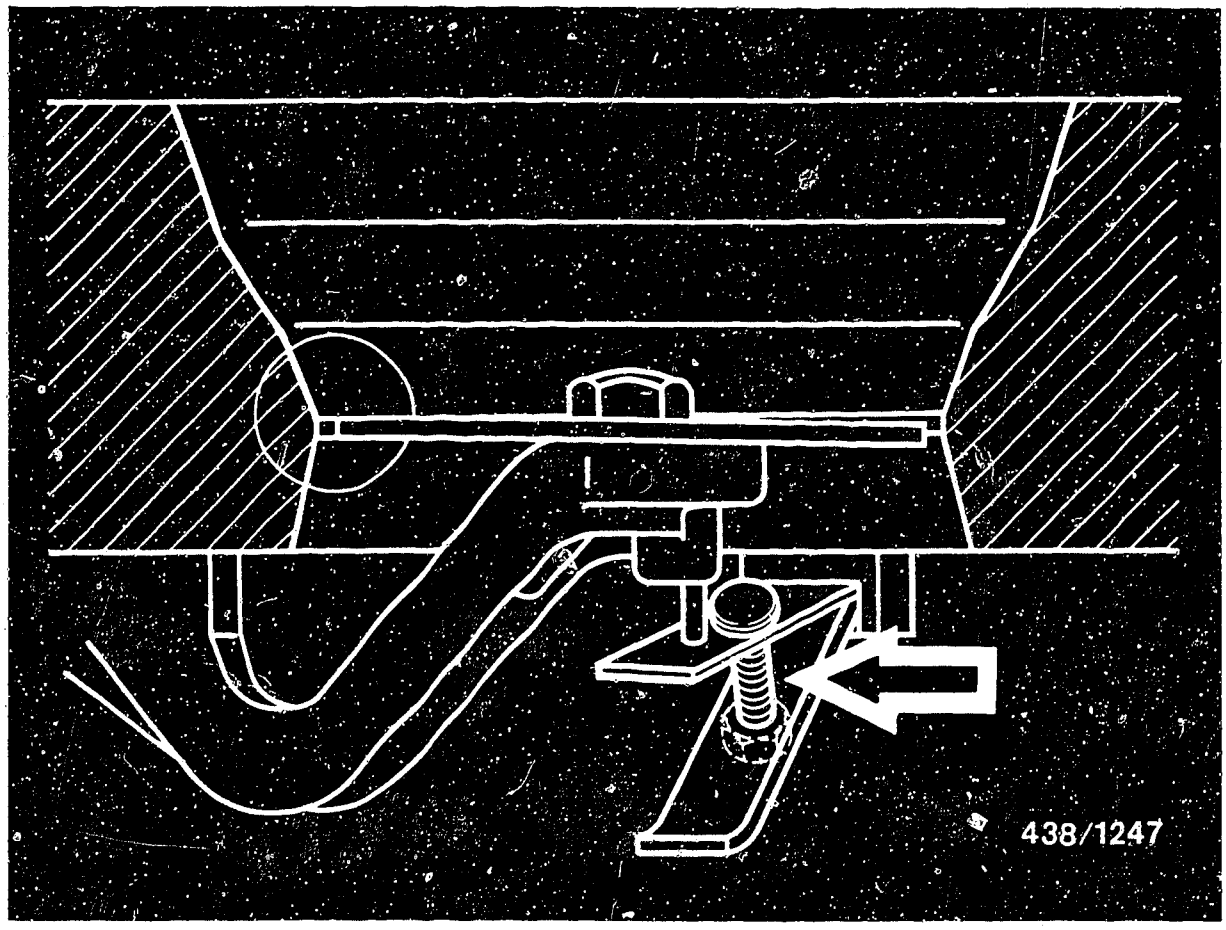
Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/10 (dia. 80 mm) as follows:

Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screw with pliers so that the sensor plate does not deflect downwards.



With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.
When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).

It must no longer be possible to turn the air-flow sensor plate by hand.

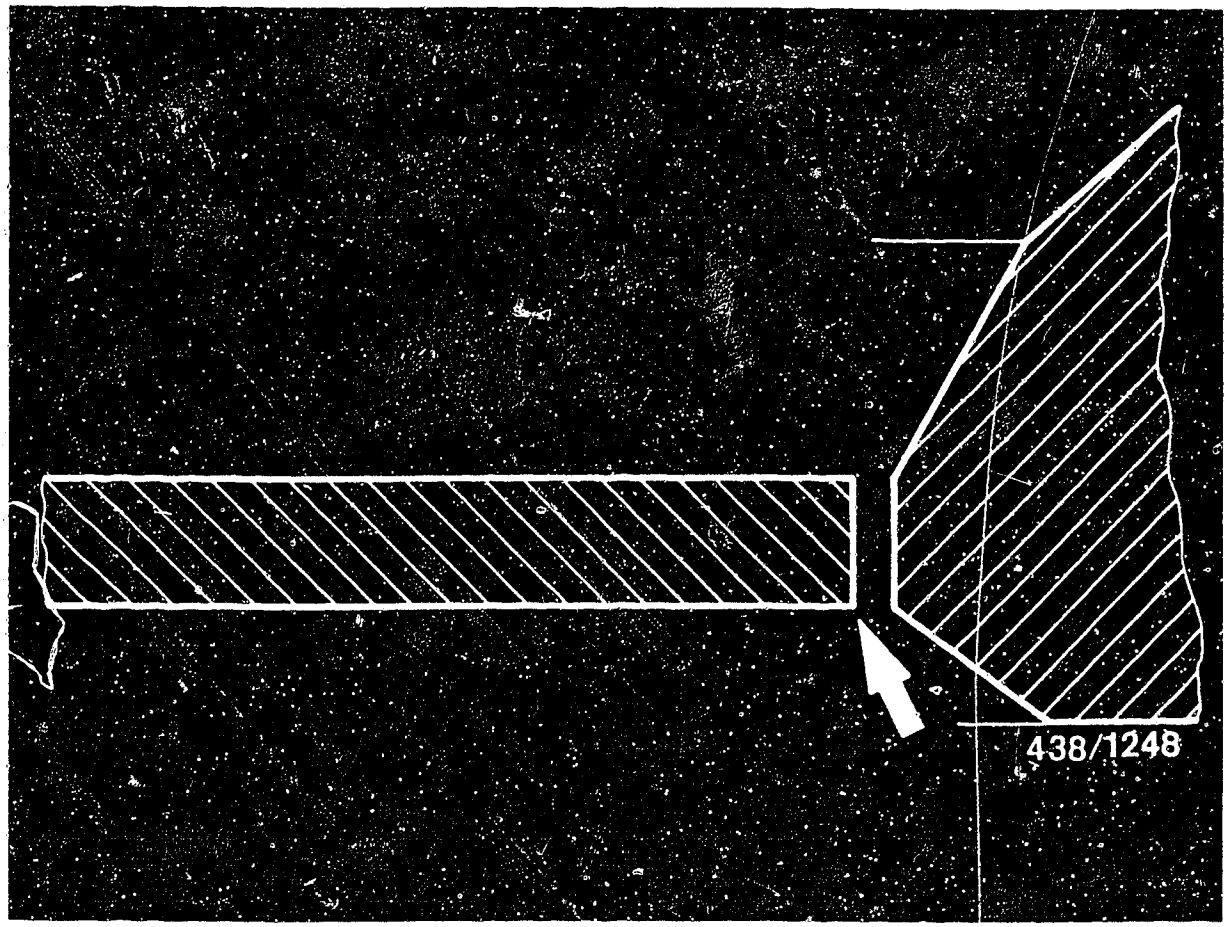


10.3 Checking and adjusting the zero position of the sensor plate (rest position):

Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the cone in the position marked with a circle in the picture. A lower position of up to maximum 0.5 mm is permissible, however the air-flow sensor plate must not project at any point on its circumference outside the cylindrical part of the air funnel.

Adjust the position of the sensor plate at the adjusting screw, arrow, (instead of the usual shaped spring) on the stop bracket. Securely tighten adjusting screw lock nut after each adjustment.



Installation position:

As a basic rule, on updraft air-flow sensors the sharp edge (arrow) must be at the bottom.

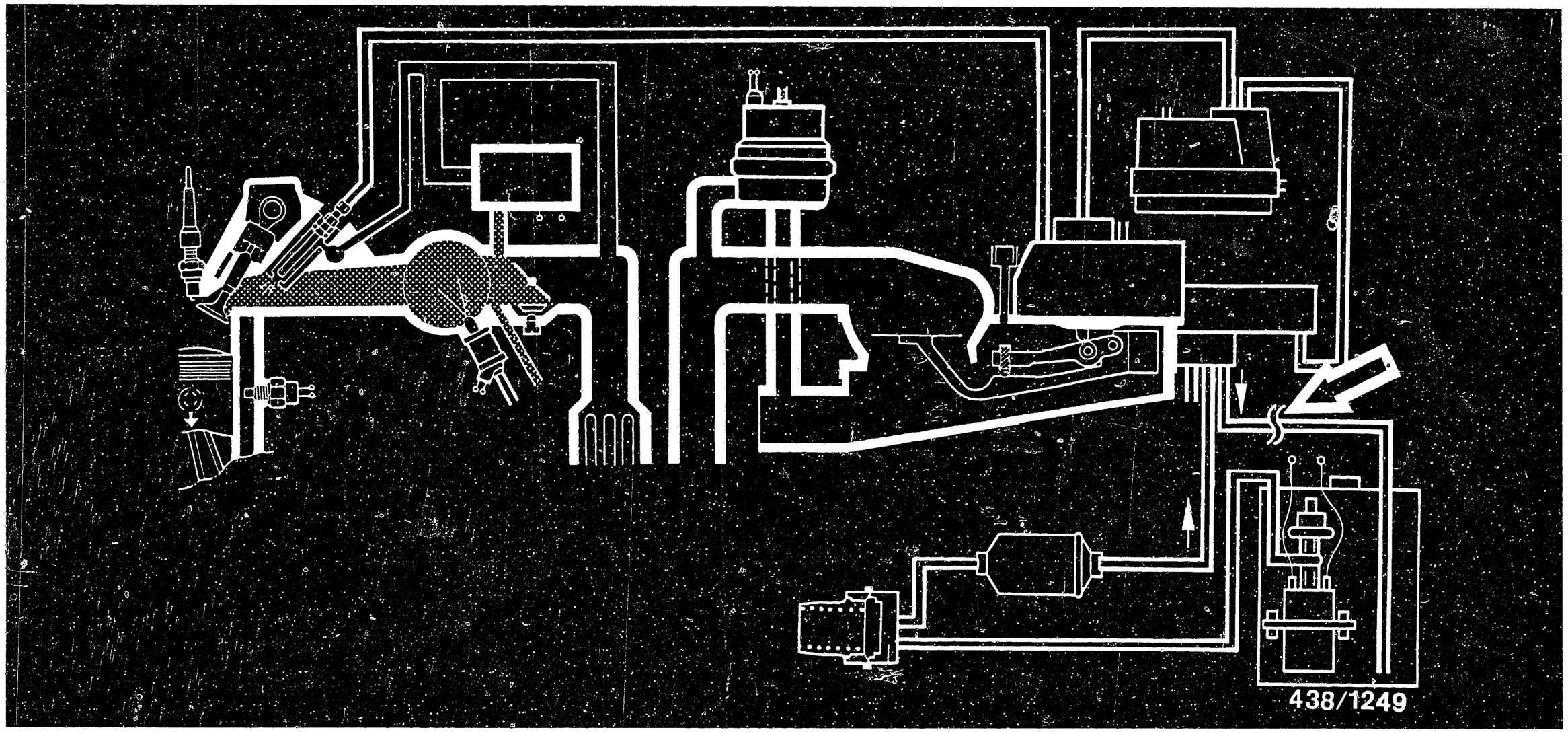
On this air-flow sensor, the sensor plate is ground on its circumference.
Due to the sharp-edged surfaces on both sides the air-flow sensor plate can be installed in any position.
There is no marking.

11. Checking the operation of the auxiliary-air device (Deleted)

The otherwise usual testing of the auxiliary-air device is not applicable to these Audi 5-cylinder vehicles.

As of 9.1983 the vehicles are equipped with an electronic idle speed stabilization system (not made by Bosch) instead of the auxiliary-air device.

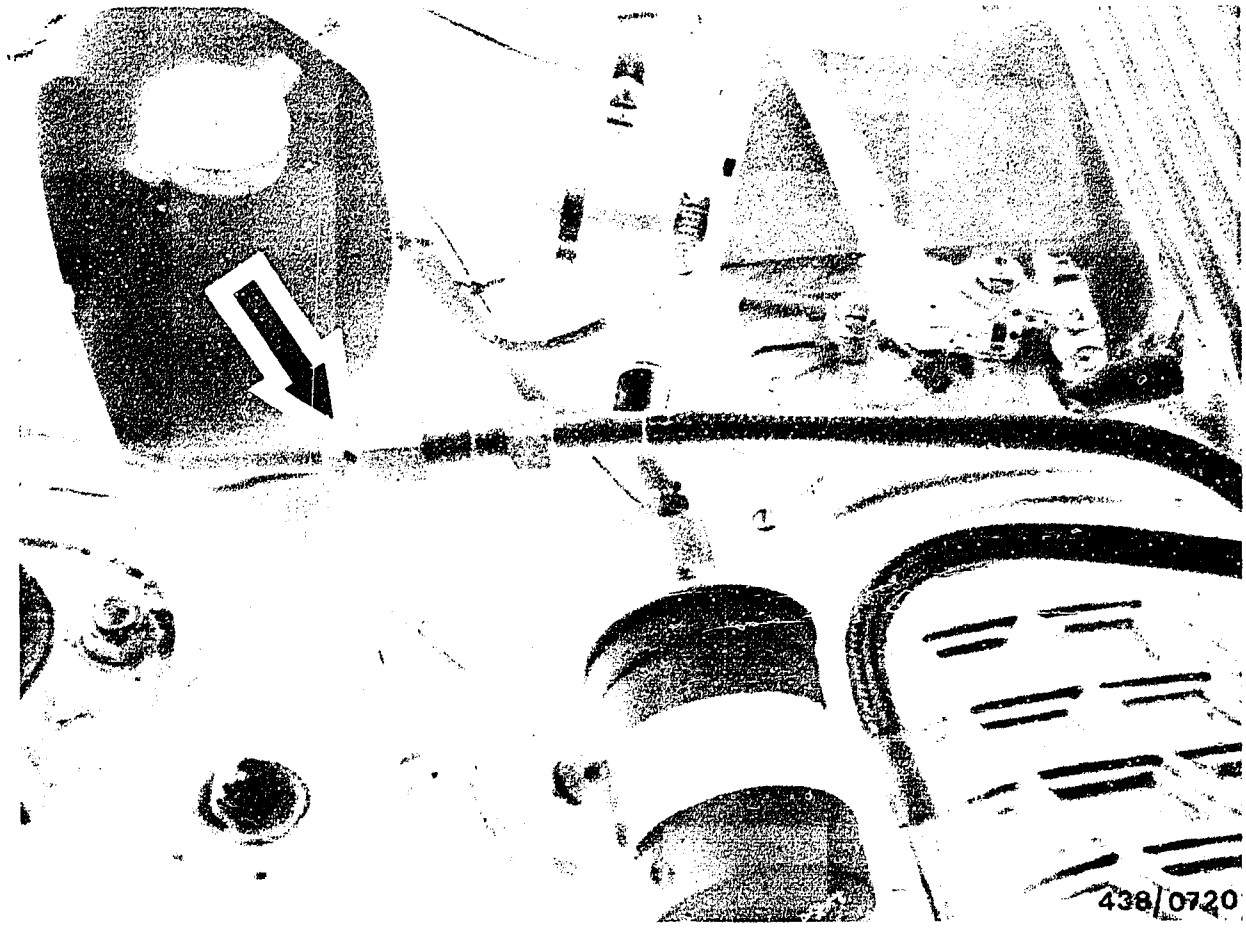
The testing of this idle speed stabilization system is described in Section 21 (Coordinate G 12).



12. Checking the operation of the electric fuel pump

12.1 Requirements

Conclusive information on the operation of the electric fuel pump can be provided only by measuring the fuel delivery under pressure, i.e. under primary pressure. Therefore, this test must be performed at the return line to the fuel tank (arrow).



12.2 Measuring point

A suitable measuring point for testing the fuel delivery is the screw connector (arrow) in the fuel return line to the fuel tank.

Before undoing this connector, open the tank filler cap in order to vent the fuel tank.

Hold the end of the hose in a graduate, approx. 1.5 litres capacity, to make the measurement.

12.3 Testing

Remove plug from warm-up regulator.
Switch on electric fuel pump for precisely 30 seconds by bridging the electrical safety circuit and measure the fuel delivery in a graduate.

Caution!

Never deflect (raise) the air-flow sensor plate with the fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.

12.4 Test specification

Fuel delivery: min. cm^3/30 seconds

12.5 Possible causes of fuel delivery being too low

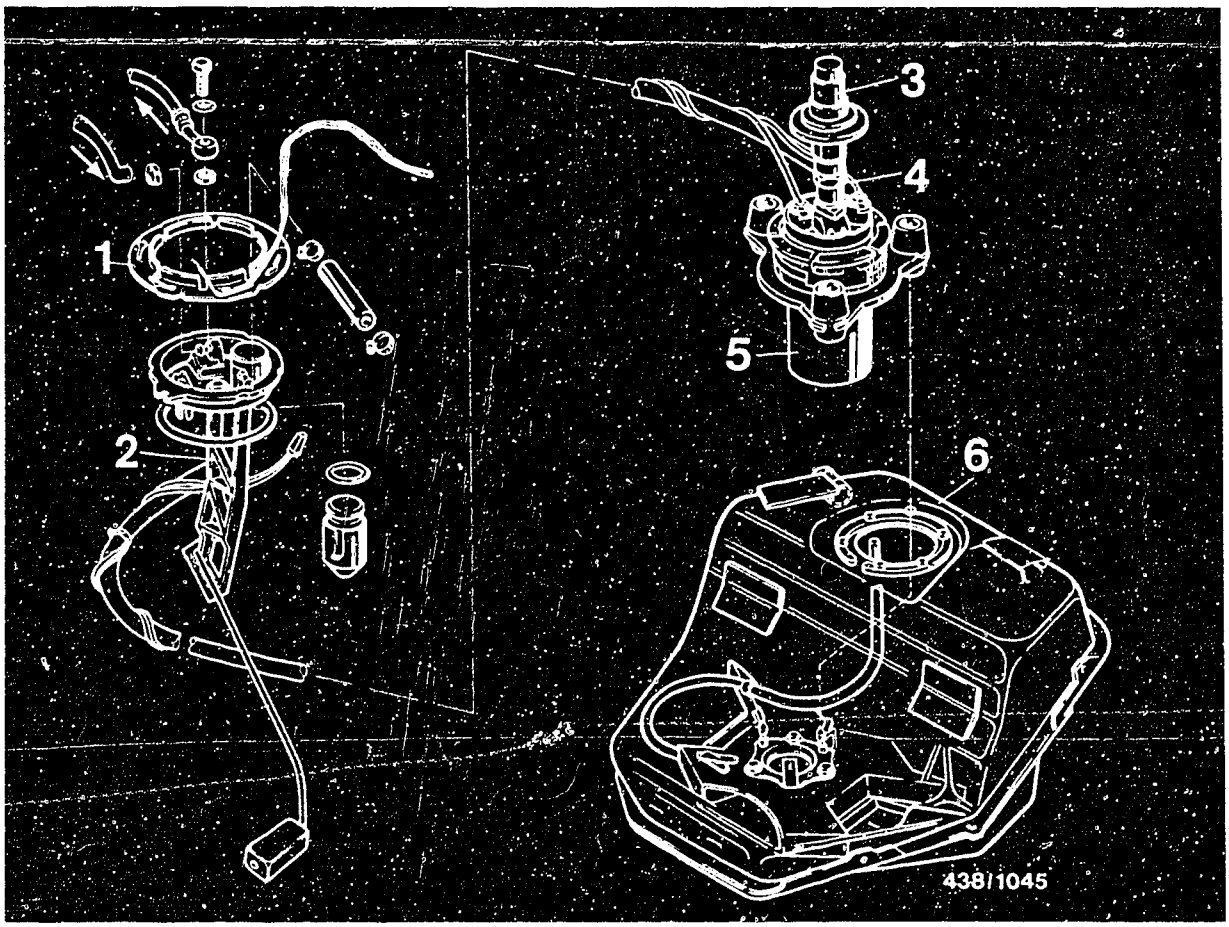
- Power supply to electric fuel pump not in order, voltage drop.
  Necessary minimum voltage across plug connector at closure ring (on top of fuel tank) = 11.5 V with electric fuel pump switched on.

- Constriction in flow line to fuel distributor.

- Fuel filter heavily fouled.

If the above-mentioned points are O.K., the cause of the trouble is the electric fuel pump itself.

Replace electric fuel pump.



1 = Closure ring
2 = Fuel tank sender
3 = Pressure damper
4 = Non-return valve
5 = Electric fuel pump
6 = Fuel tank

12.6 Removing and installing the intank electric fuel pump on Audi 100 / 5E

Remove closure ring and take out fuel tank sender.
Withdraw complete unit (electric fuel pump, non-return valve and pressure damper) out of the ratchet springs on the base of the tank.
Replace electric fuel pump.

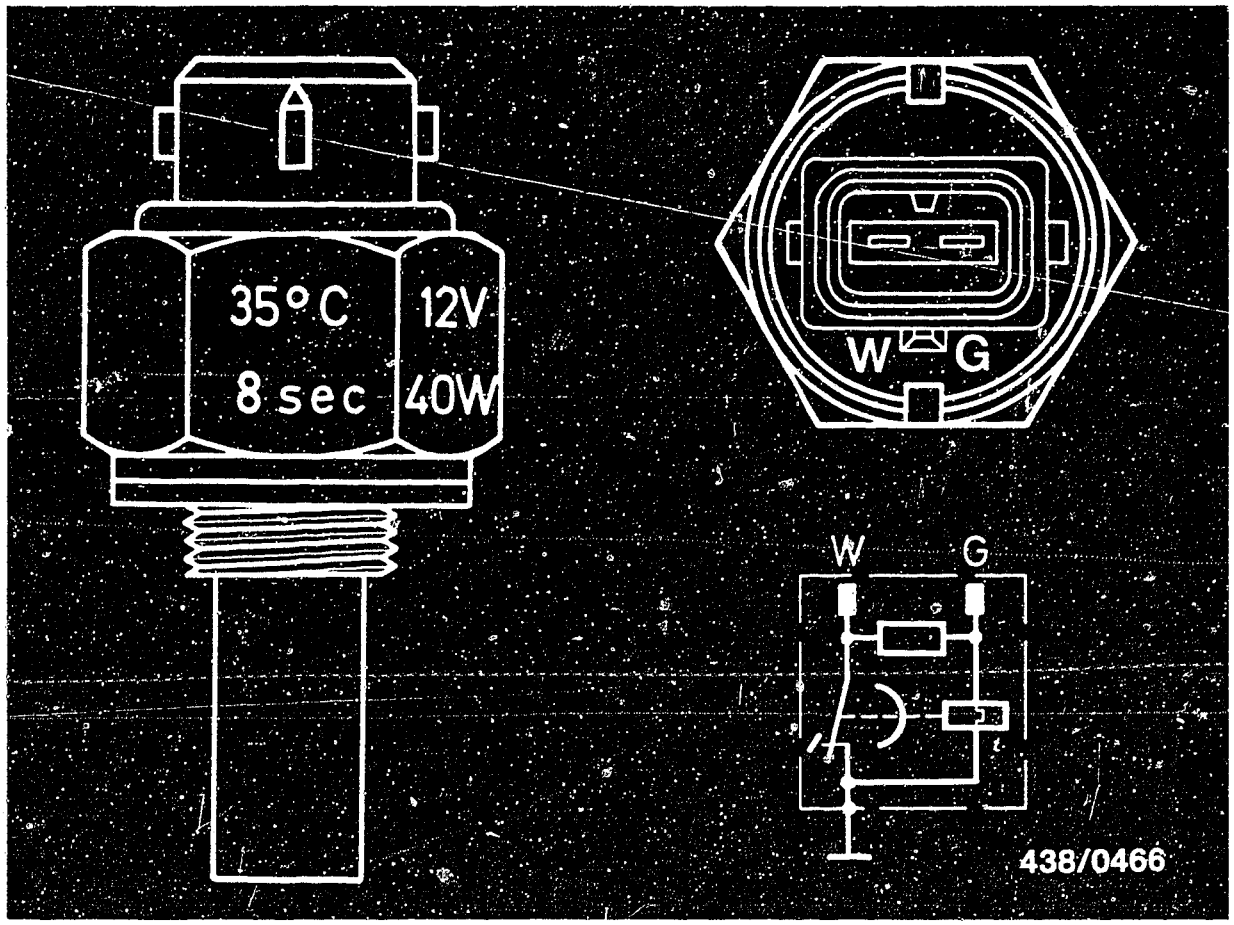
When installing, use a new seal and make sure that the electric fuel pump is correctly positioned.
Danger of kinking fuel lines.

13. Checking the cold-starting system, thermo-time switch, start valve time-pulse relay

13.1 Thermo-time switch

The thermo-time switch (arrow) is screwed into the cylinder head at the rear underneath the ignition distributor.

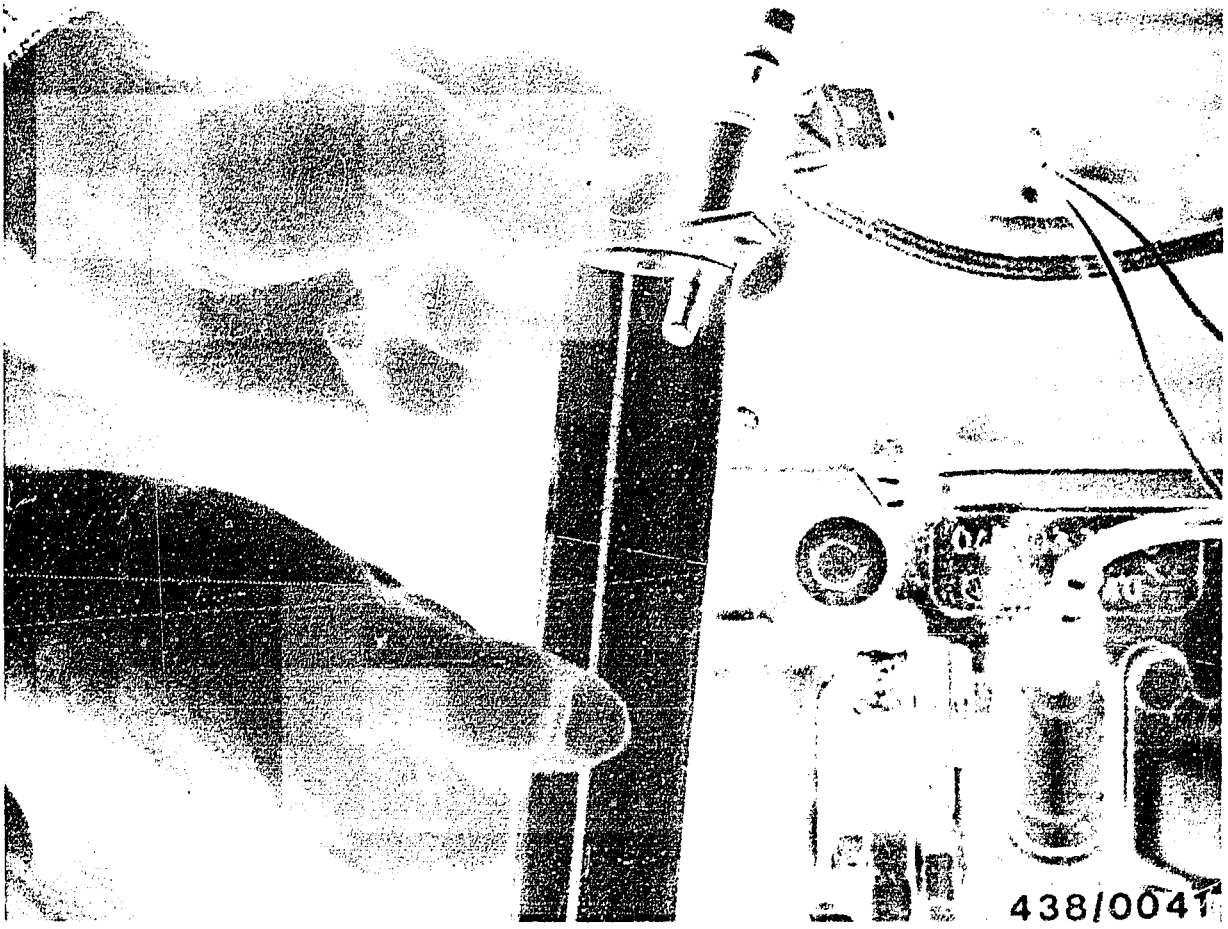
It must be removed for testing.
Catch any escaping coolant in a suitable vessel.



Thermo-time switch No. 0 280 130 214
0 280 130 223

The switching temperature + 35°C and the switching time at - 20°C of 8 seconds are stamped into the hexagonal section of the thermo-time switch.
The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

at a temperature below °C	above °C	Resistance measurement between Term "G" and "ground" (housing)	Term "W" and "ground" (housing)	Term "G" and term. "W"
+ 30		25 ... 40 Ω	0 Ω	25 ... 40 Ω
	+40	50 ... 80 Ω	100 ... 160Ω	50 ... 80 Ω



13.2 Start valve

Remove the start valve. Hose line remains connected.
Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7450/70.
Important note:
During this test, do not let the connecting cable touch B +.
Danger of fire due to sparking!
Hold the start valve in a suitable container (e.g. the graduate).
Switch on the electric fuel pump by bridging the safety circuit.
Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

C A U T I O N !

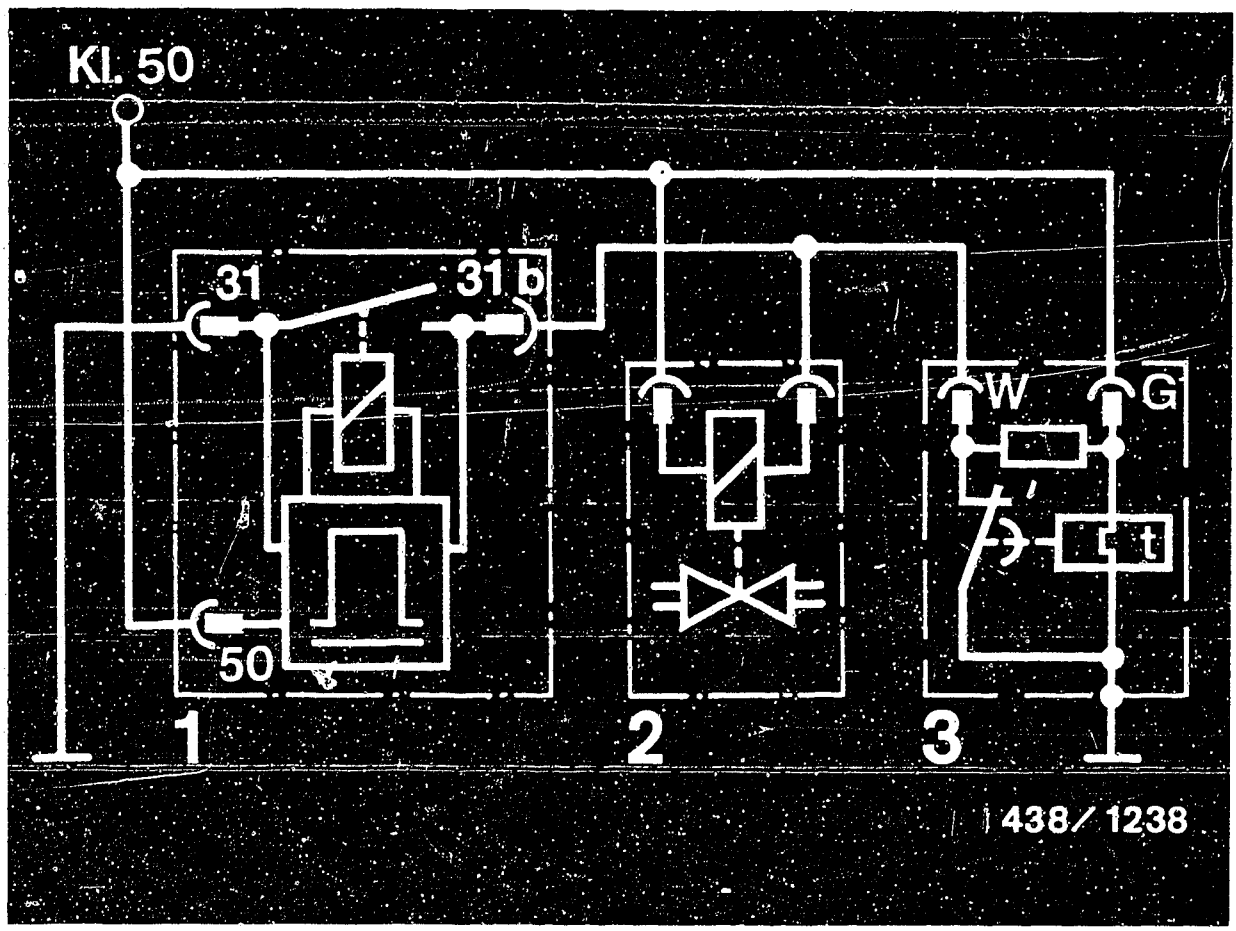
Never depress (deflect) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operating of the starting motor may lead to serious engine damage.

Switch on the ignition (max. 30 seconds). The start valve must now open and squirt fuel.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F 8.



1 = Time-pulse relay
2 = Start valve
3 = Thermo-time switch

13.3 Time-pulse relay for hot starting

The electrical test is performed at an engine temperature of > 40°C.
Disconnect plug from start valve and connect multimeter. Select voltage measuring range approx. 10 V.
When starting, voltage pulses must be indicated on the multimeter.
If there are no pulses or if there is a permanent voltage, renew the time-pulse relay.

14. Checking the control pressures

14.1 Preliminary remarks:

The control pressures tested in the following are in each case governed by the warm-up regulator.
If the test results are incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

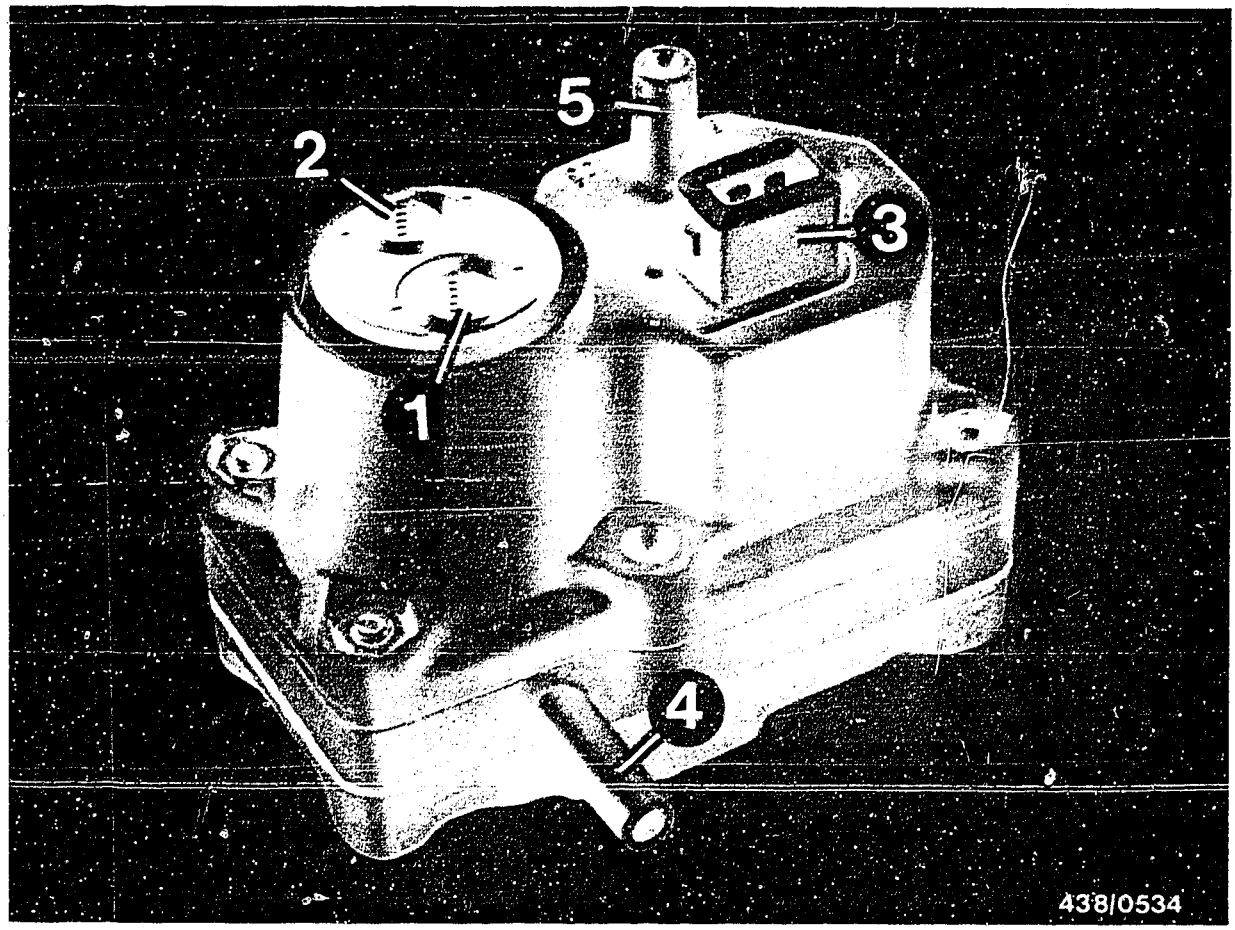
These possible faults are:

- No or too low a voltage at the electric connector.
- Fuel return from the warm-up regulator blocked or constricted
- Too high or too low a fuel delivery for the control-pressure circuit.

The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests.

Test specification: 160...240 cm^3/min

Reference is made to the other possible causes of trouble in the respective test step.

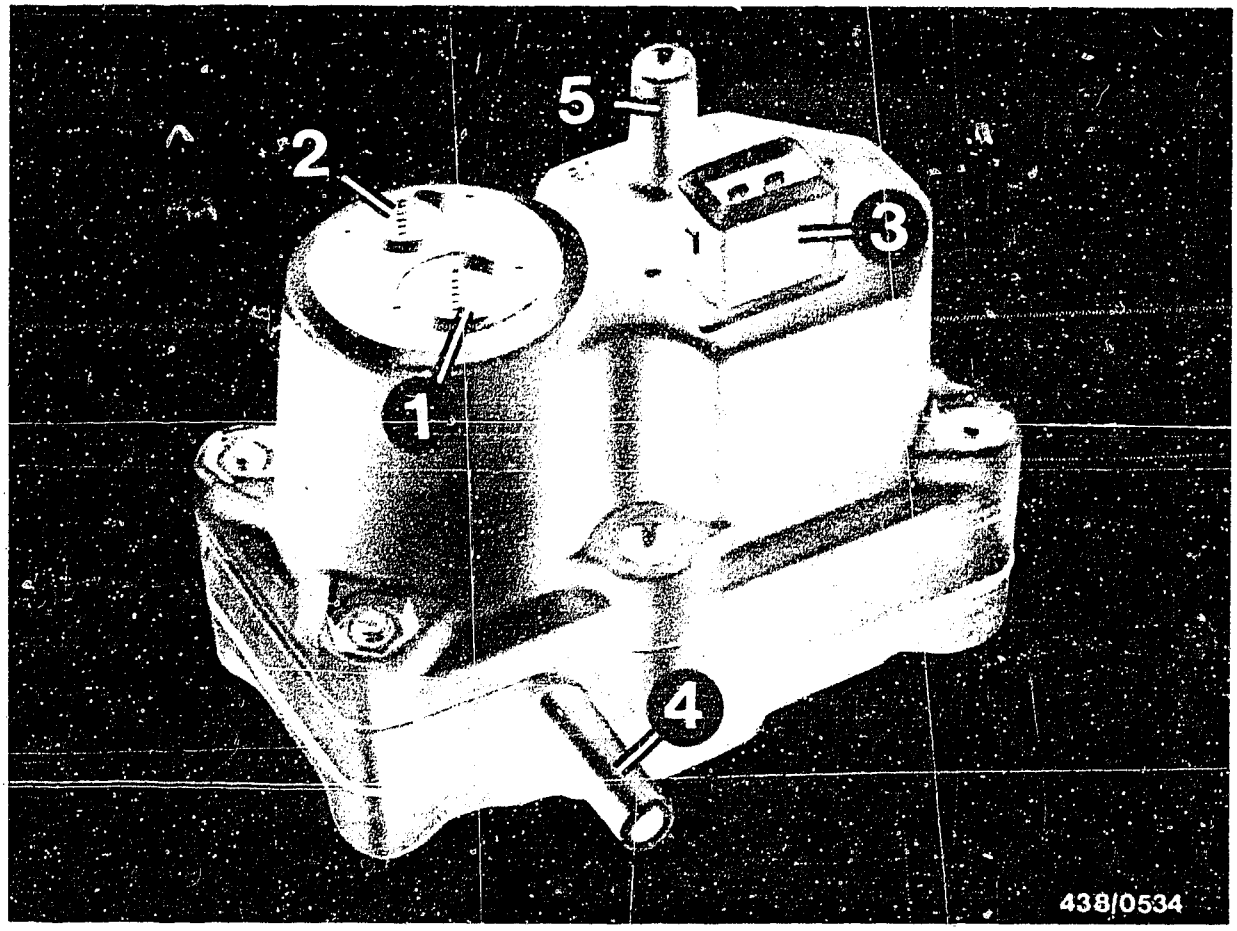


1 = Inlet connection (M 10 x 1)
2 = Return connection (M 8 x 1)
3 = Electric connection
4 = Connection for intake-manifold pressure (after throttle valve)
5 = atmospheric connection (connection between air-flow sensor and throttle valve).

14.2 Warm-up regulator version

0 438 140 124/ ...125

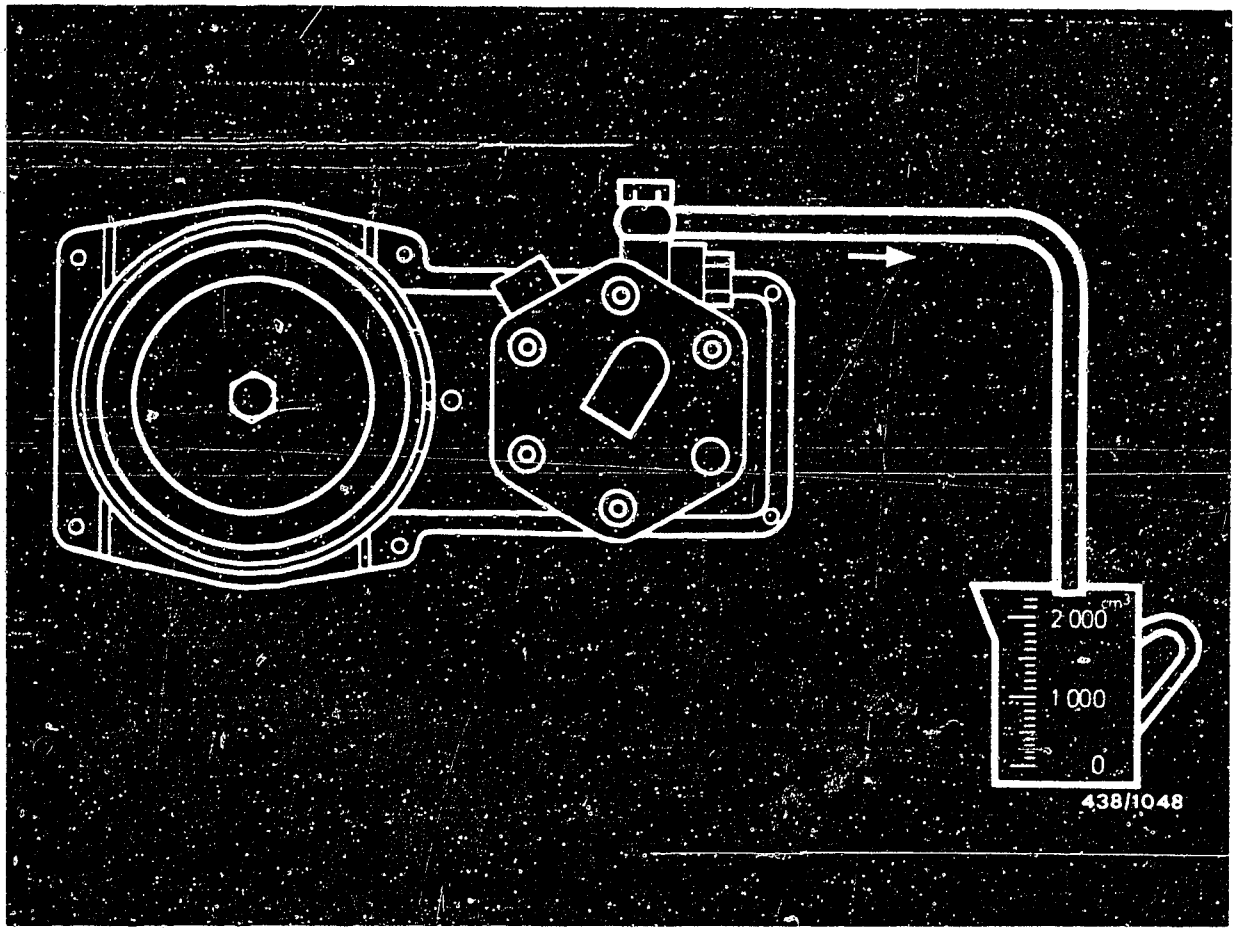
The warm-up regulator is a version for intake-manifold-pressure-controlled full-load enrichment. This means that the cold and warm control pressures are additionally influenced by the intake-manifold pressure acting on the full-load diaphragm of the warm-up regulator.



1 = Inlet connection (M 10 x 1)
2 = Return connection (M 8 x 1)
3 = Electric connection
4 = Connection for intake-manifold pressure (after throttle valve)
5 = Atmospheric connection (connection between air-flow sensor and throttle valve)

The manifold-pressure connection port (4) is on the intermediate plate.

On the top side of the housing cover there is an atmospheric connection pipe (5) (protected against dirt by ventilated cap).

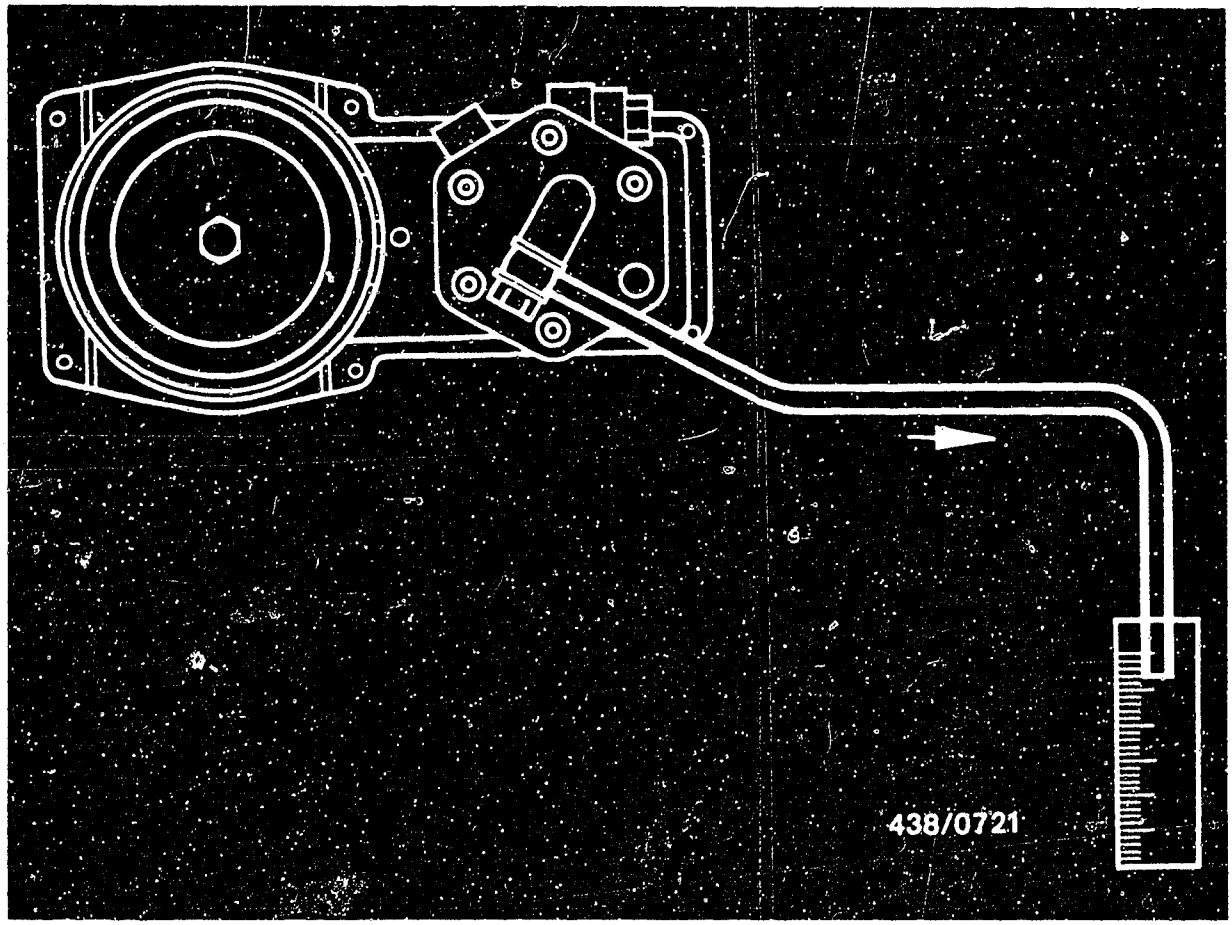


14.3 Testing the fuel delivery for the control-pressure circuit

Before testing, make sure that the electric fuel pump is in proper working order.

Test specification: Min. 950 cm²/30s

As the measuring point, use the screw connector in the fuel return line to the fuel tank.



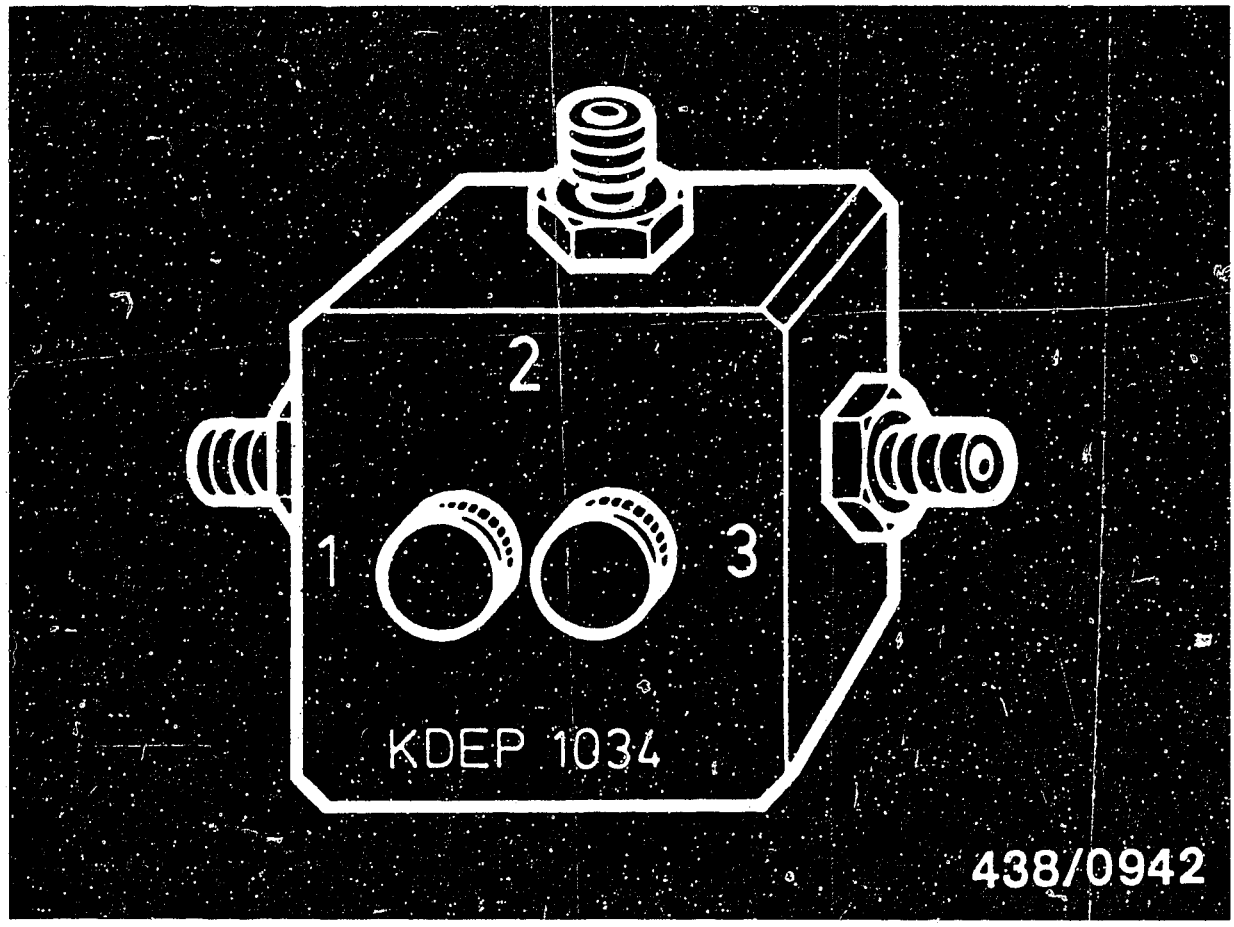
Unscrew control-pressure line (coming from fuel distributor) on warm-up regulator and hold end of hose in a graduate (approx. 0.5 l capacity).

Switch on the electric fuel pump for precisely one minute by bridging the electrical safety circuit and measure the fuel delivery.

Test specification: 160 ... 240 cm^3/min.

If the measured value is outside tolerance, the cause is the fuel distributor.

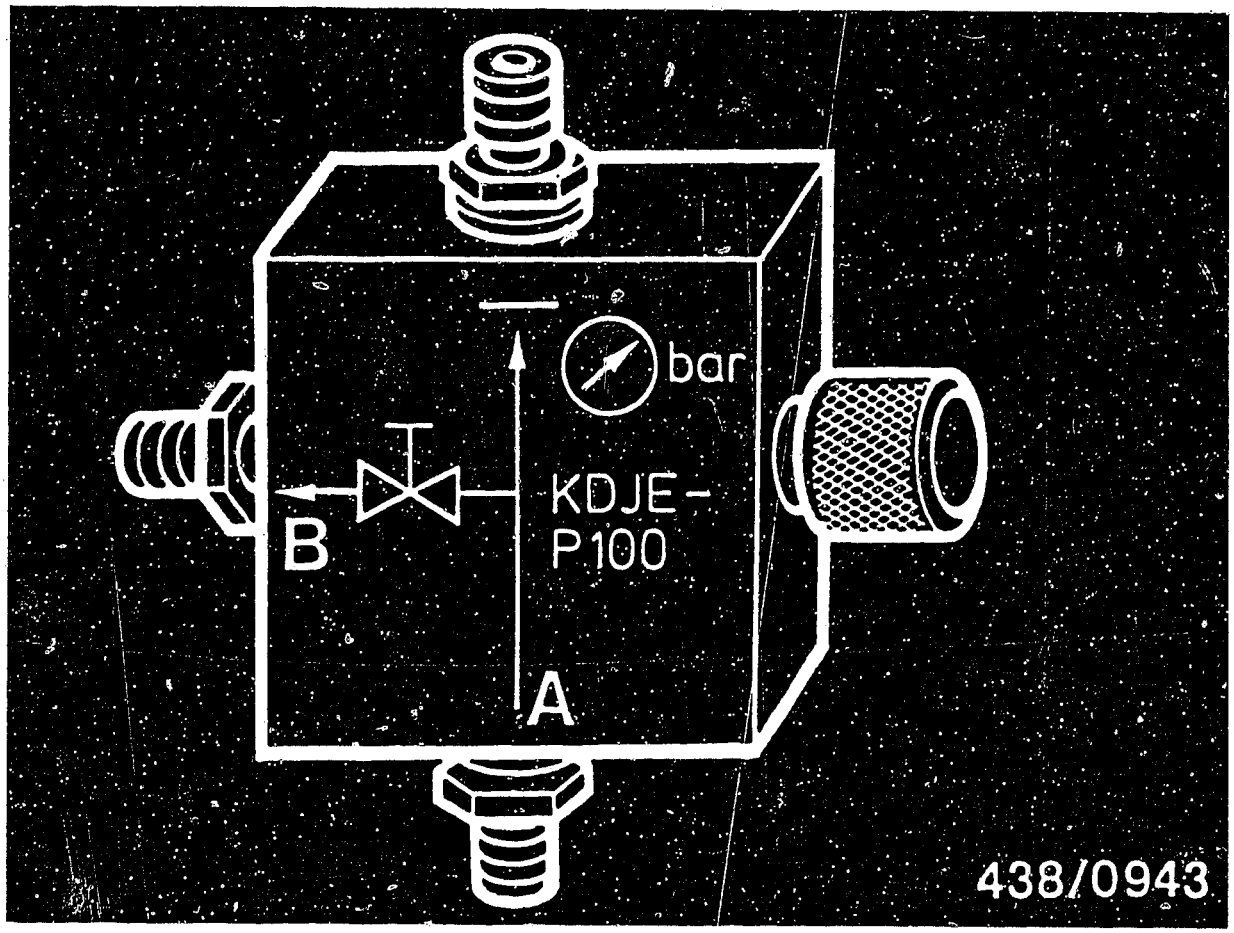
Replace fuel distributor.



14.4 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034)

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws.

The connections of the directional-control valve are numbered.

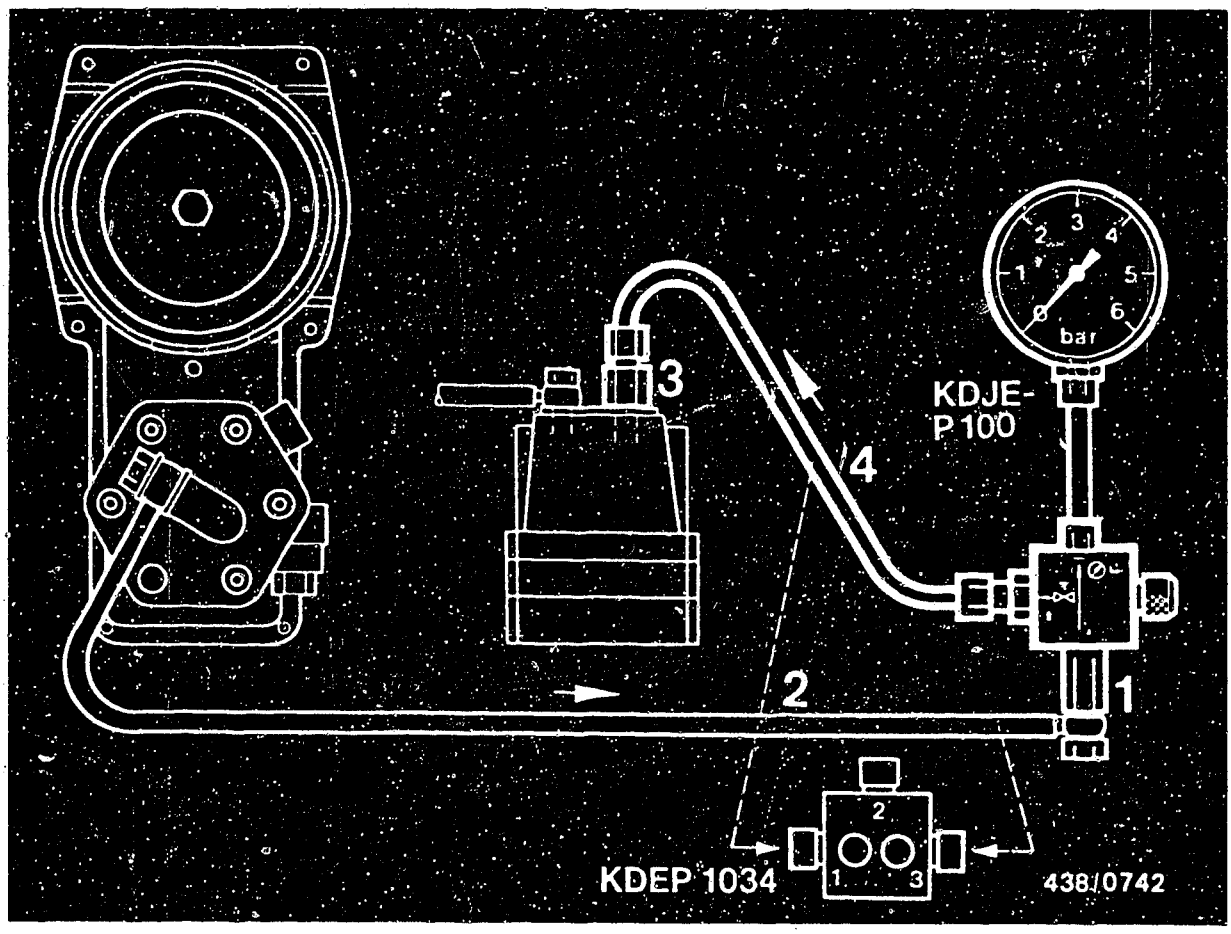


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw.

The connections of this directional control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

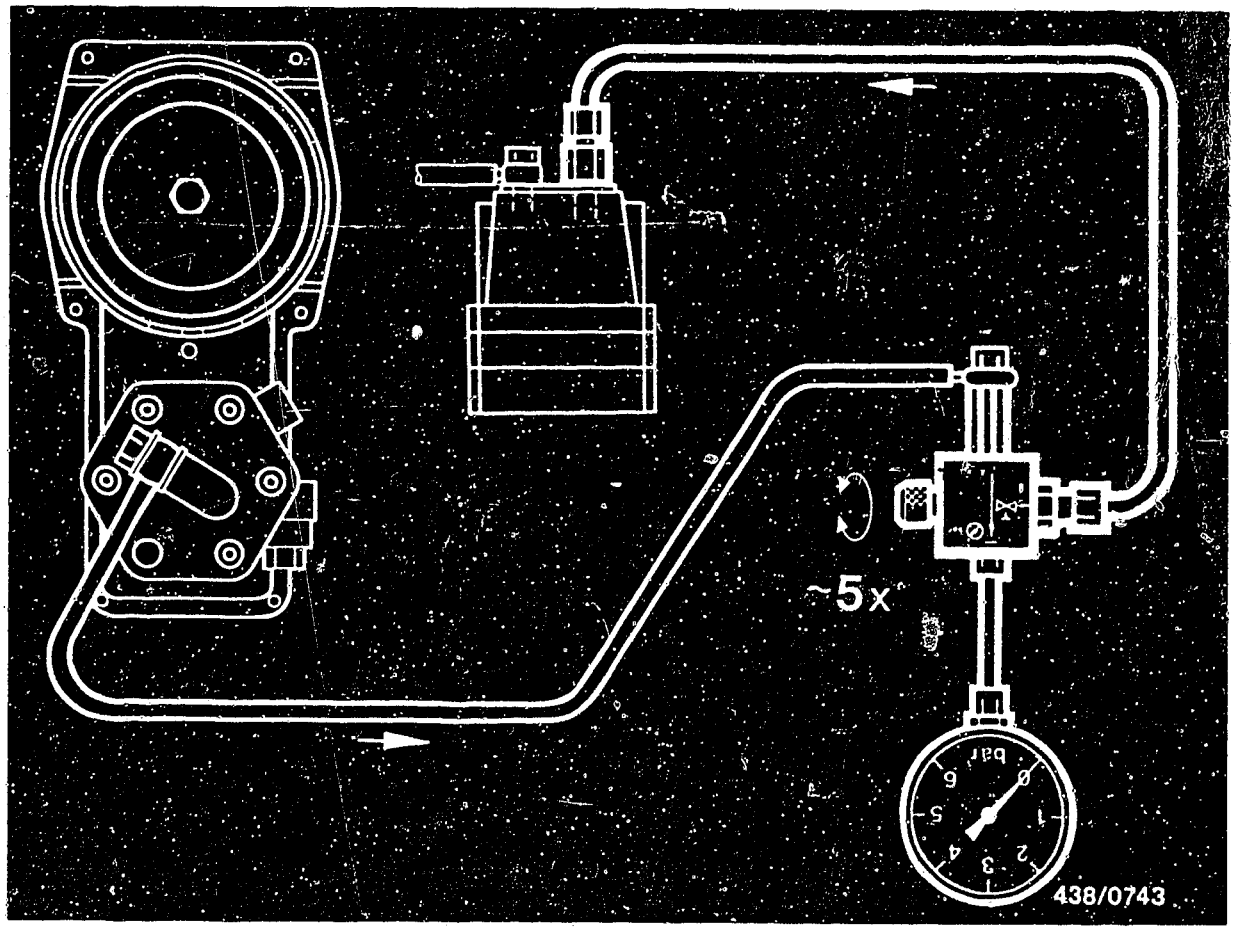
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Fit using connecting-parts set KDJE-P 100/12.

- Screw the adapter (1) with seal onto inlet fitting A or 3 of the directional-control valve.
- Unscrew the control-pressure line (2) on the warm-up regulator and connect with inlet-union screw M 10 x 1 and seal rings to the adapter (1).
- Screw connecting piece (3) of connecting-parts set into inlet of warm-up regulator and, using hose line (4), connect to outlet fitting B or 1 of the directional-control valve.

Suspend the pressure gauge from the engine hood (possibly using a wire hook).



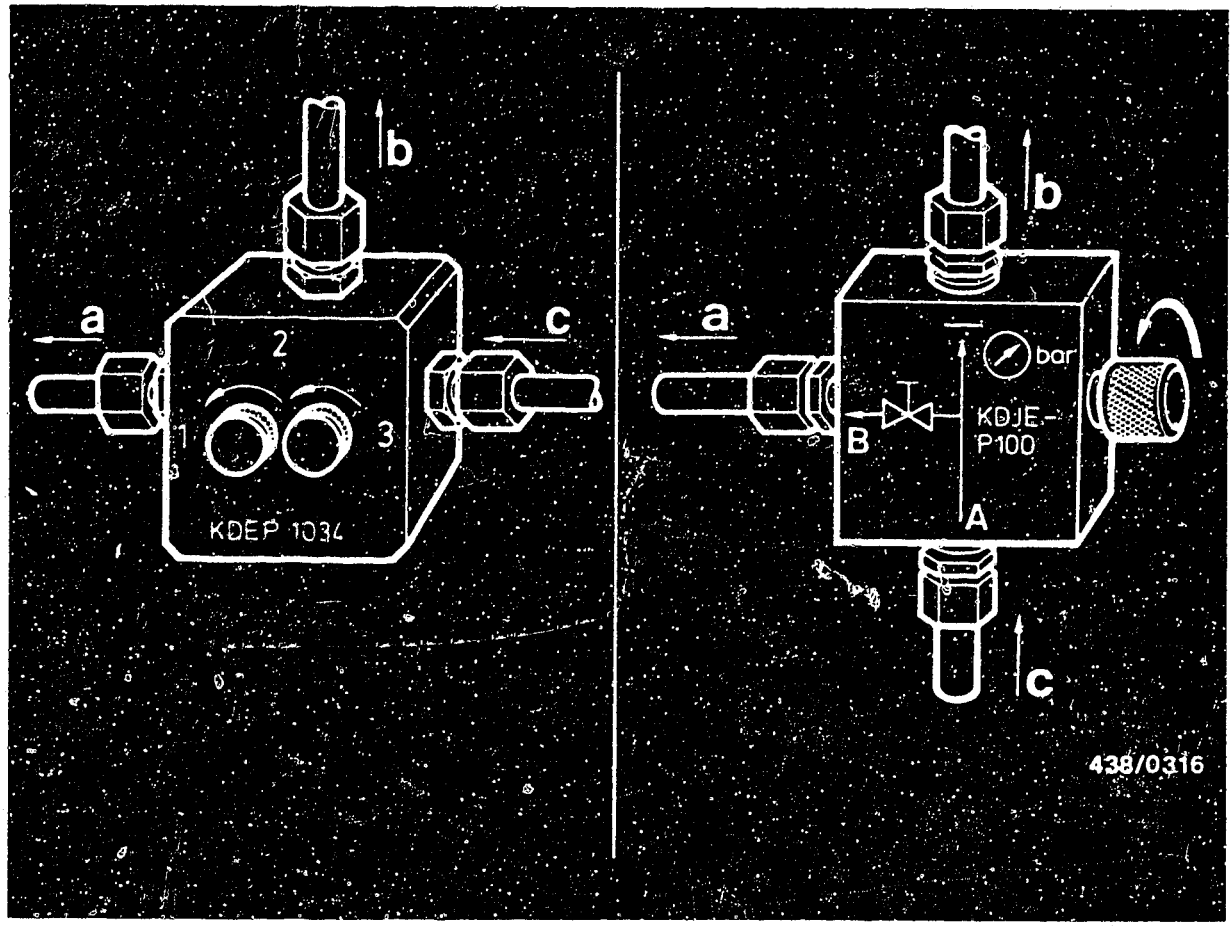
14.5 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

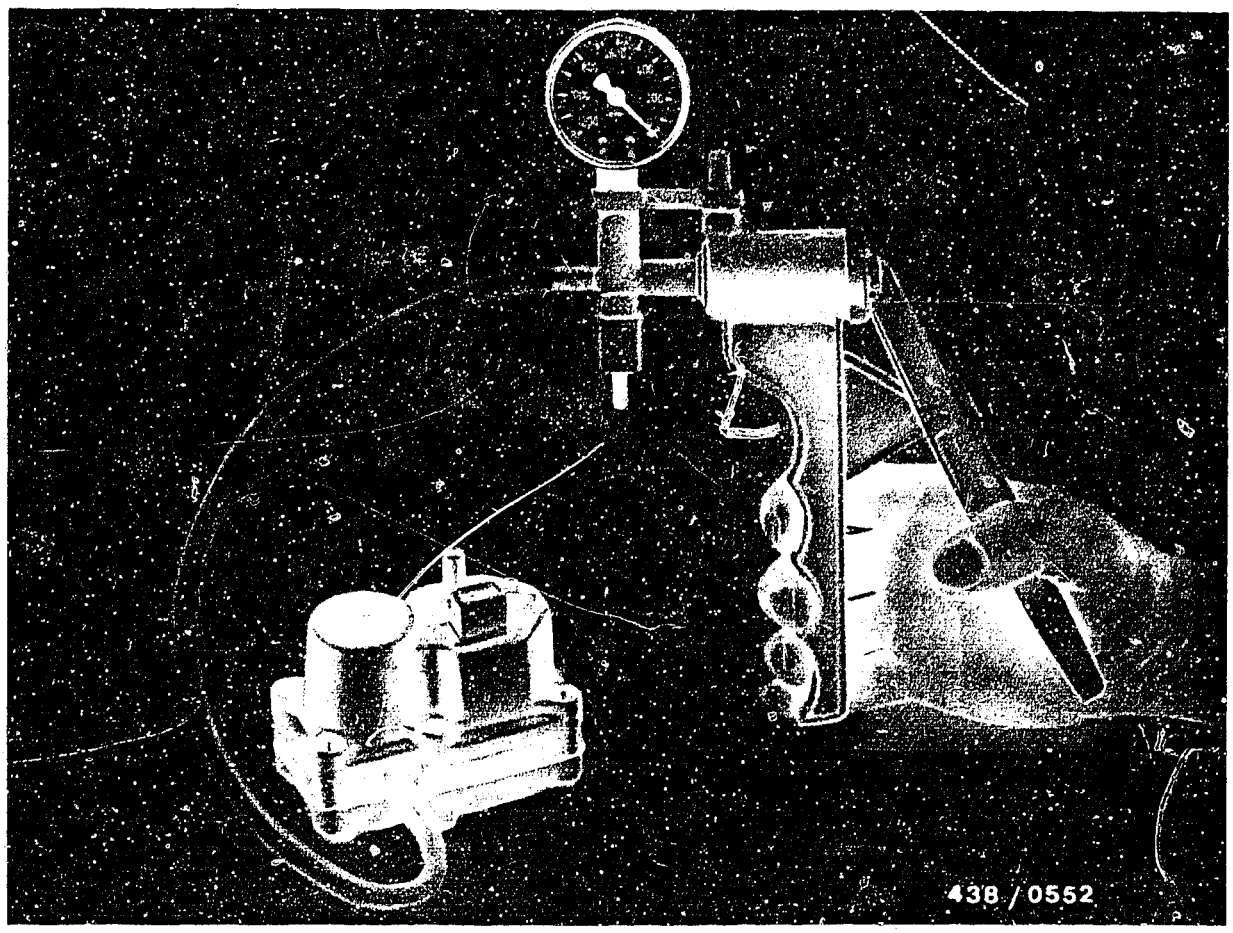
14.6 Testing the "cold" control pressure

The test is performed with the engine switched off. The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.

Pull off the plug from the warm-up regulator.

Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

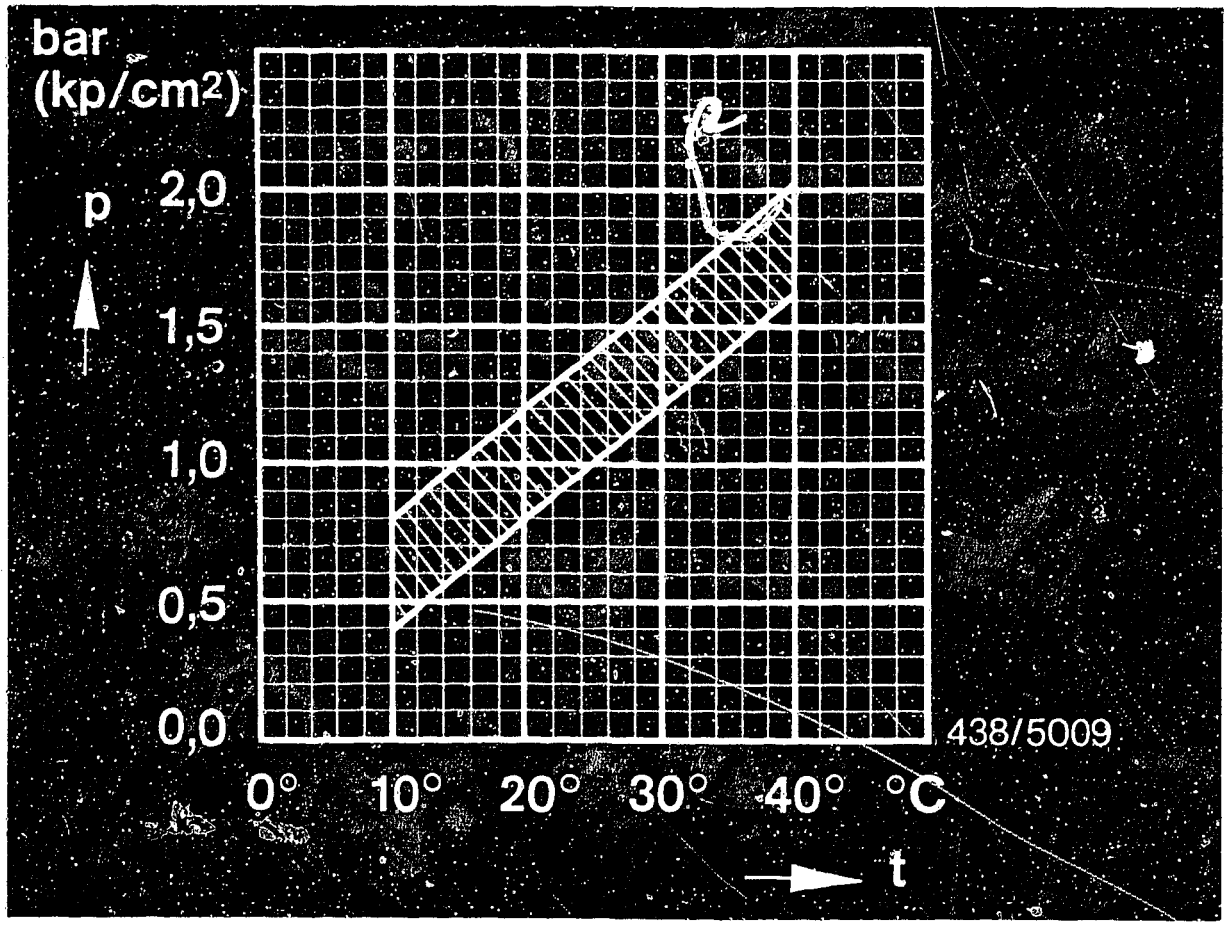


Part no. of warm-up regulator: 0 438 140 124/ ...125

The control pressure is checked with simulated intake-manifold pressure, i.e. vacuum is applied to the warm-up regulator.
To do this, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator on the intermediate plate of the housing. The picture shows testing with the recommended Mityvac hand vacuum pump.

Setting value for testing: 400 ..600 mbar
(300...450 mmHg)

The "cold" control pressure is indicated on the pressure gauge of the pressure tester.



p = Control pressure (bar or kgf/cm² gauge pressure)
t = Ambient temperature (°C)

Warm-up regulator Part No.: 0 438 140 124
0 438 140 125

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20°C
Nominal control pressure = $\frac{0{,}8...1{,}2 \text{ bar}}{\text{gauge pressure}}$

If the measured "cold" control pressure differs from the nominal value, it may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high.
  Test fuel delivery.
  Test specification: 160...240 cm^3/min.

- Fuel return (possibly push-up valve) from warm-up regulator blocked or constricted (if control pressure too high). Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.

If the warm-up regulator has been replaced or a defect has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates F 8.

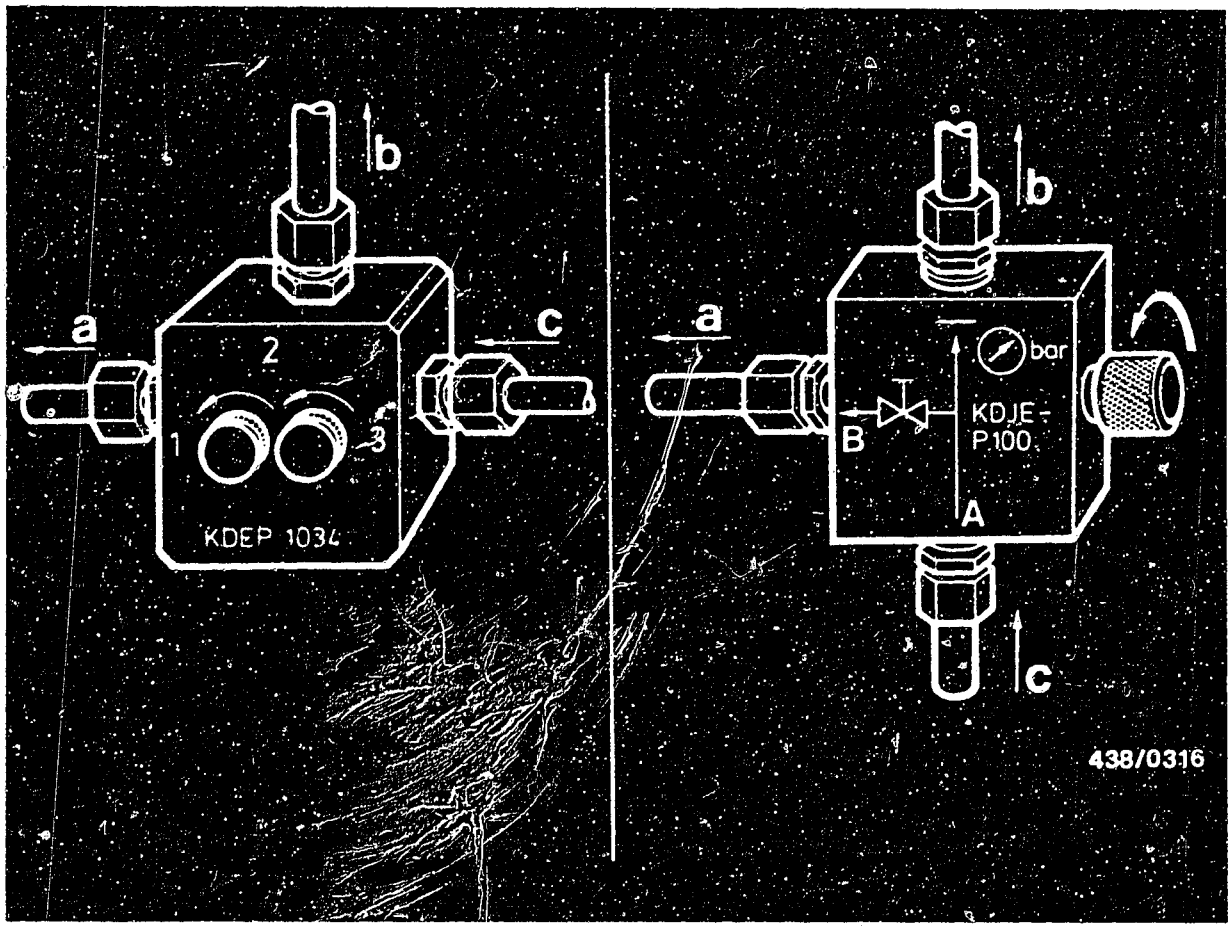
Note:

The above-described control-pressure test tells you whether the control-pressure circuit and warm-up regulator are O.K.

Incorrect control-pressure functions during vehicle operation may, however, also be due to a malfunction in the manifold pressure control system for the warm-up regulator.

This system must be tested with the engine at normal operating temperature and running. Therefore, it is best to combine the test with the final idle adjustment.

Idle adjustment is described on Coordinate F 8.



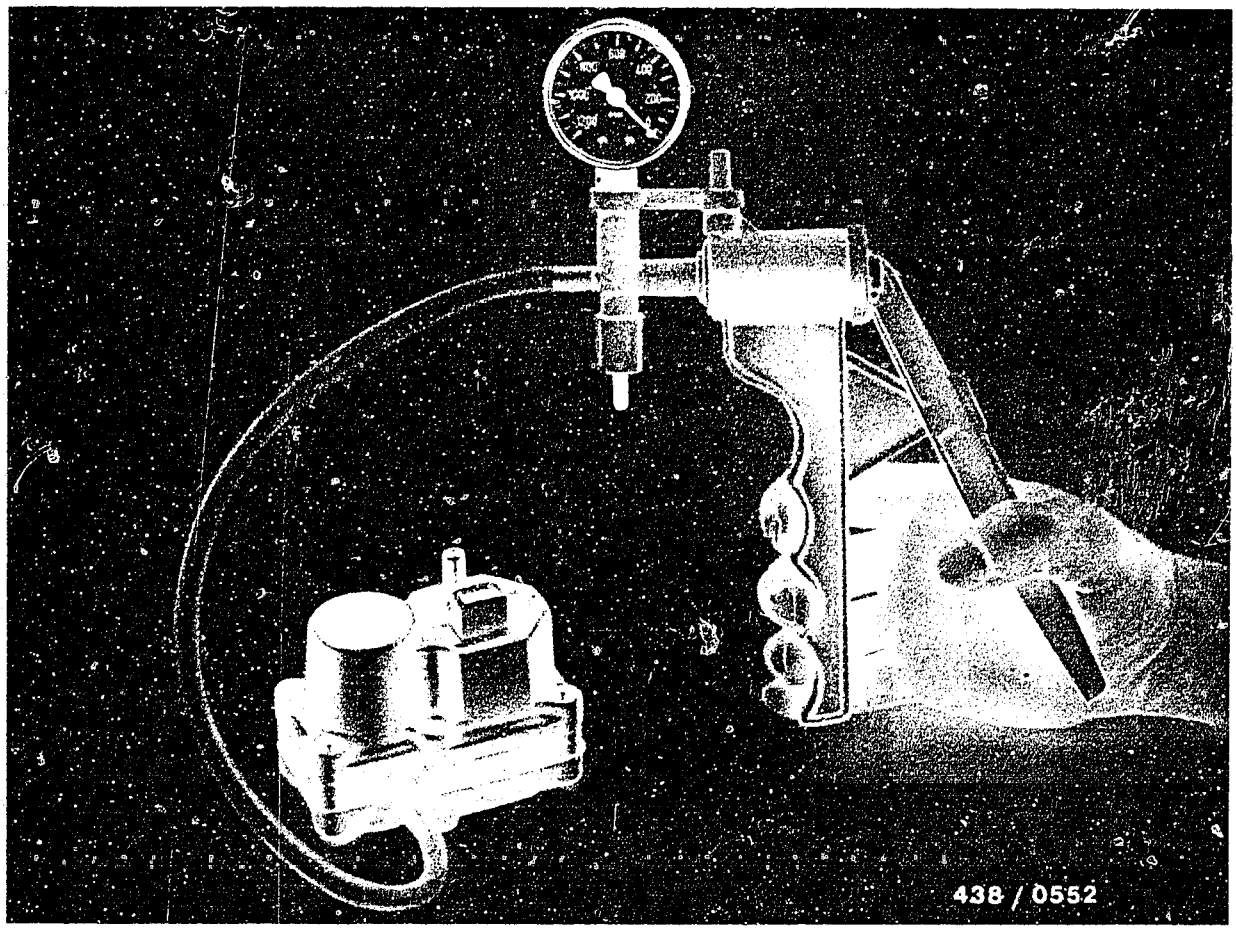
a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.7 Checking the "warm" control pressure

- Warm-up regulator Part No.: 0 438 140 124/ ...125

The test is performed with the engine switched off, once without intake-manifold pressure being applied, once with simulated intake-manifold pressure (vacuum) applied.

Open the valve screw of the directional-control valve (or both valves in the case of KDEP 1034).



For testing with simulated intake-manifold pressure, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator (in the intermediate plate of the housing).

The picture shows the recommended Mityvac hand pump.

Setting value for the test: 400...600 mbar (300...450 torr)

Test procedure:

The temperature of the engine is not important.

Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Plug the plug onto the warm-up regulator.

The control pressure increases (warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

Test first of all without the application of intake-manifold pressure, then test with simulated intake-manifold pressure (vacuum) in accordance with the values given below:

- "Warm" control pressure
  Part No. of warm-up regulator: 0 438 140 124/ ...125

Test step	Test specifications[+]
Test with atmospheric pressure (without vacuum)	2,6...3,0 bar (2,7...3,1 kgf/cm^2)
For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator. Setting value: 400 ...600 mbar (300 ...450 mmHg)	3.4...3.8 bar (3.5...3.9 kgf/cm^2)

[+] Pressures in the test-specification table are given in bar and/or in kgf/cm^2 (gauge pressure).

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following faults:

If control pressure too high:

- Fuel delivery for the control-pressure circuit too high.
Test fuel delivery.
Test specification: 160...240 cm^3/min.

If measured value is outside tolerance, renew fuel distributor.

- Fuel return from the warm-up regulator blocked or constricted.
Eliminate constriction.

- Warm-up regulator has hydraulic defect.
Replace warm-up regulator.

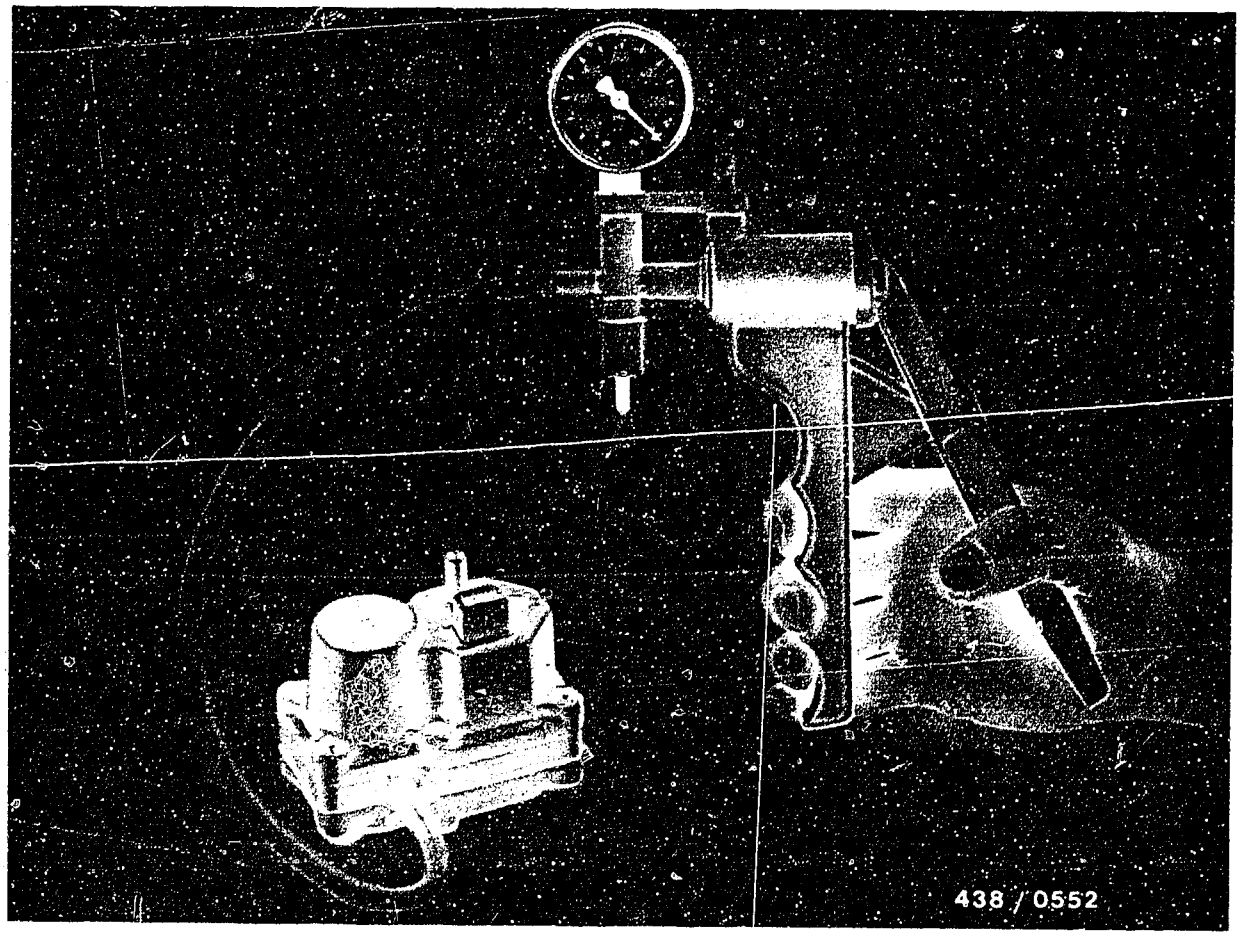
If control pressure too low:

- Power supply open-circuit.
Eliminate open circuit. Ensure that the plug is contacting properly.

- Battery voltage too low, voltage drop.
Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
If necessary, repeat test with engine running in order to obtain the normal generator voltage of approx. 14 V when the vehicle is in operation.

- Fuel delivery for the control-pressure circuit too low.
Test fuel delivery.
Test specification: 160...240 cm^3/min.
If measured value is outside tolerance, renew fuel distributor.

- Warm-up regulator defective. Heating coil open-circuit. Hydraulic defect. Replace warm-up regulator.



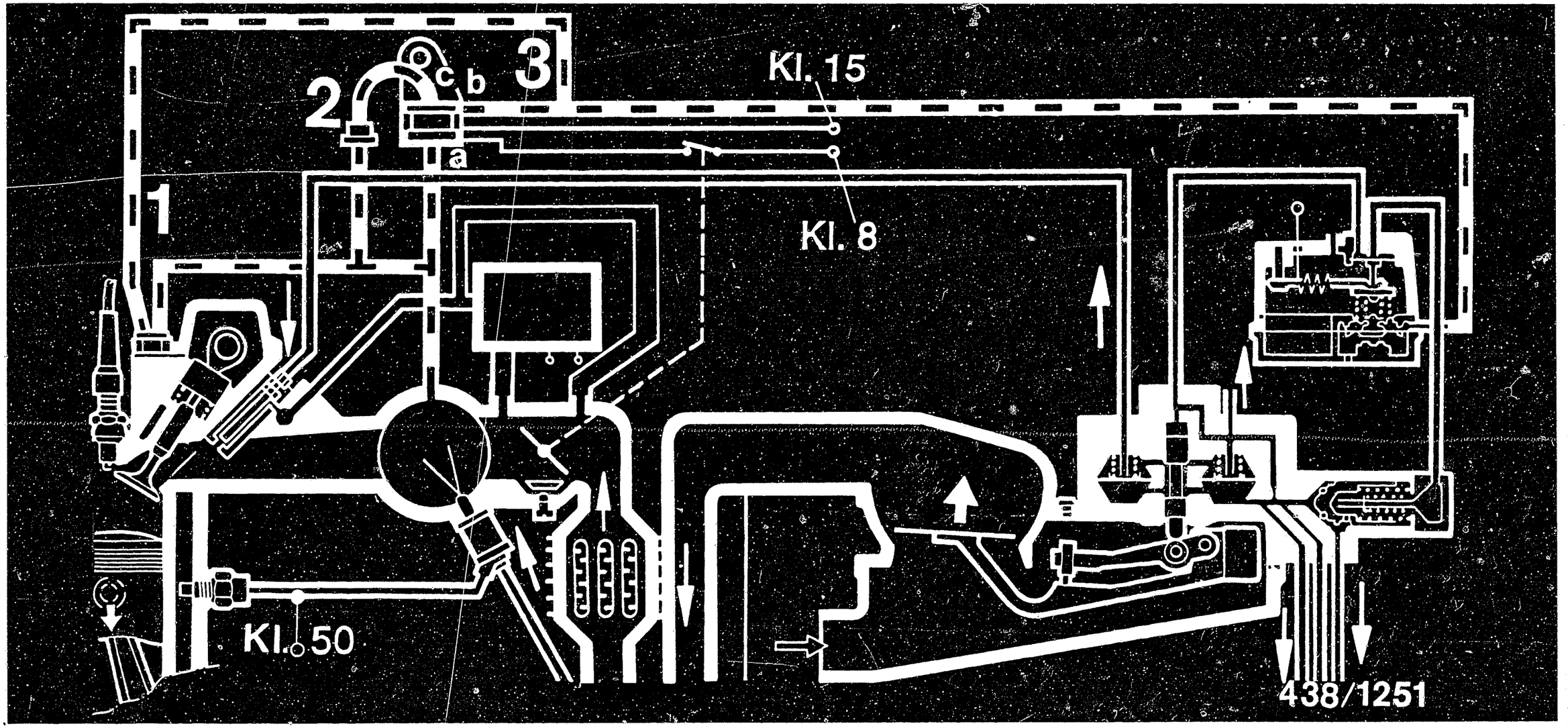
14.8 Testing the full-load diaphragm for leaks

Switch off the electric fuel pump.

Connect the "Mityvac" hand vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator and build up a vacuum.
Setting value: 400...600 mbar (300...450 mmHg)

Test specification for air leaks:
Max. pressure drop within 15 s 100 mbar (75 mmHg)

If the pressure drop is too great, replace the warm-up regulator.

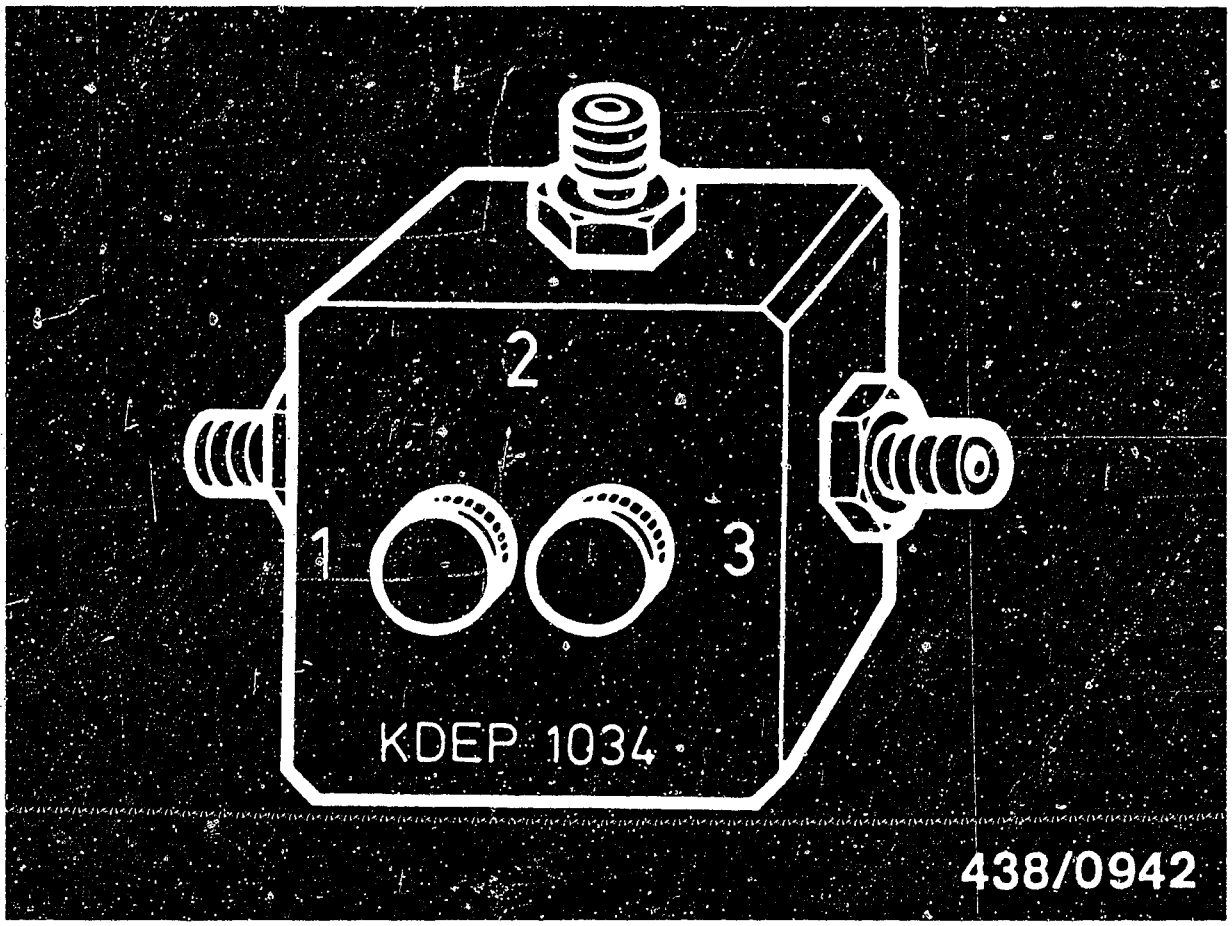


Intake-manifold pressure lines 1 = Thermopneumatic valve 2 = Non-return valve 3 = Two-way valve

Finally, check the condition and the correct fitting of the connecting hose from the intake manifold to the warm-up regulator via non-return valve, two-way valve and thermopneumatic valve. If necessary, replace the hose.

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

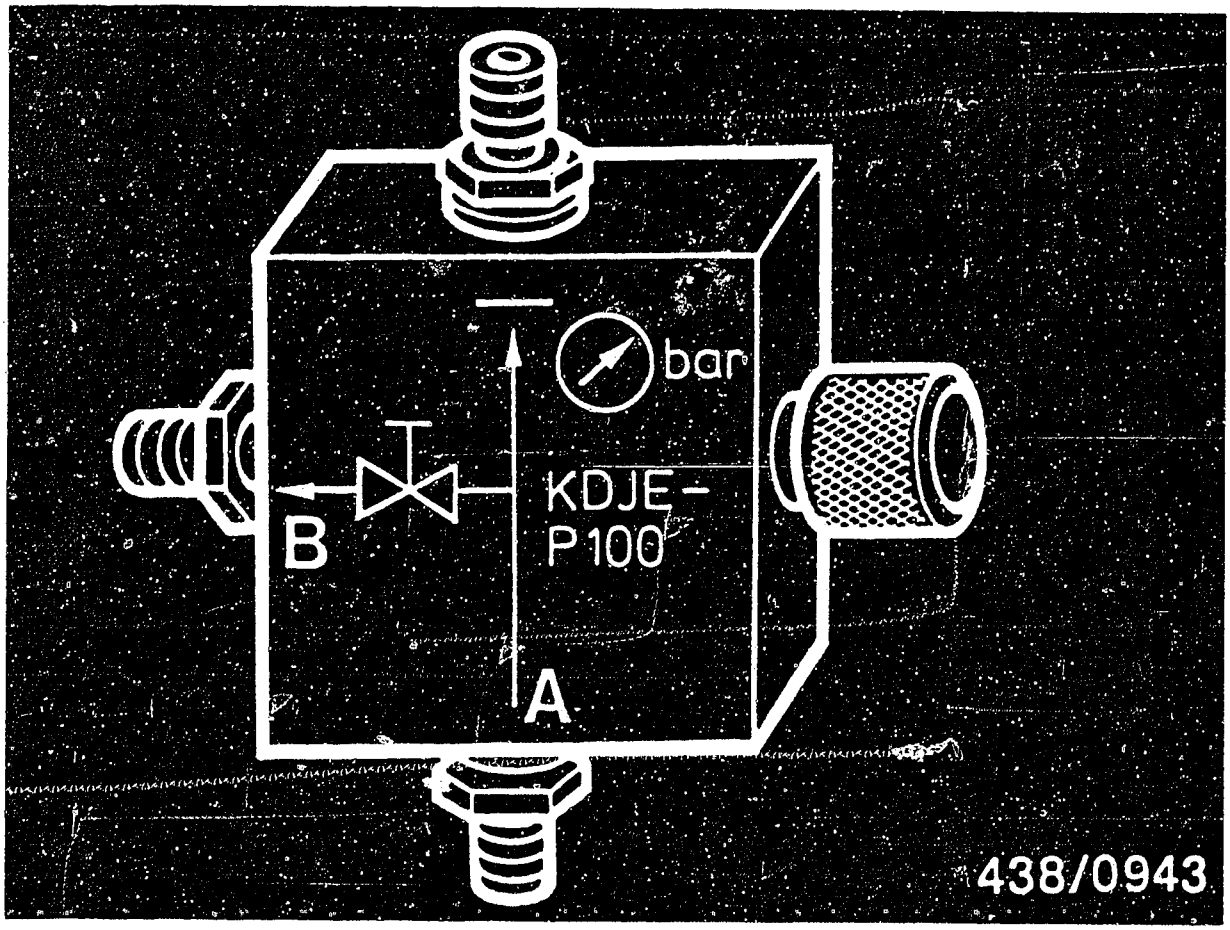
Idle adjustment is described on Coordinate F 8.



15. Testing and adjusting the primary (system) pressure:

15.1 Mounting the pressure tester KDJE-P100 (formerly KDEP 1034):

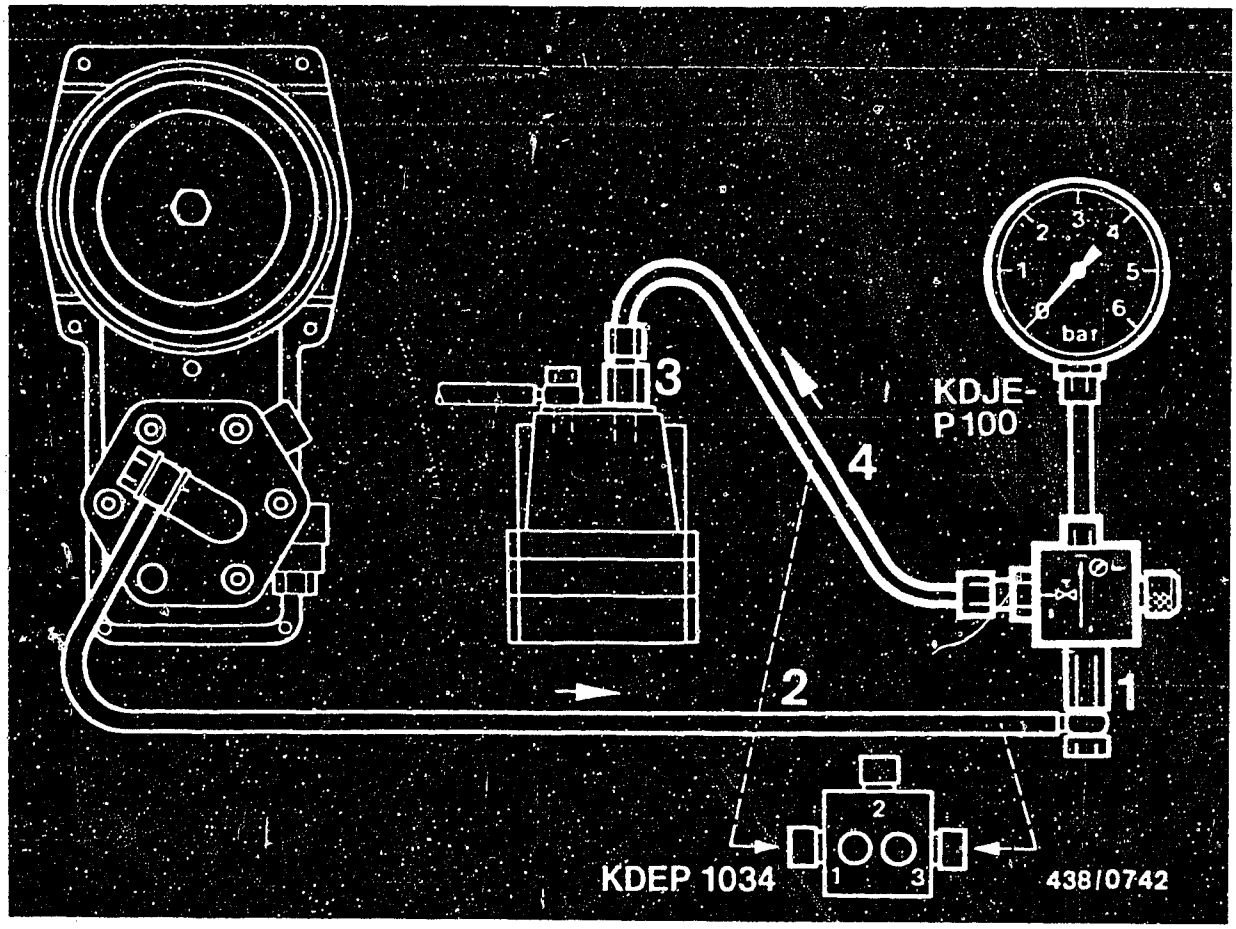
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered.



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw. The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



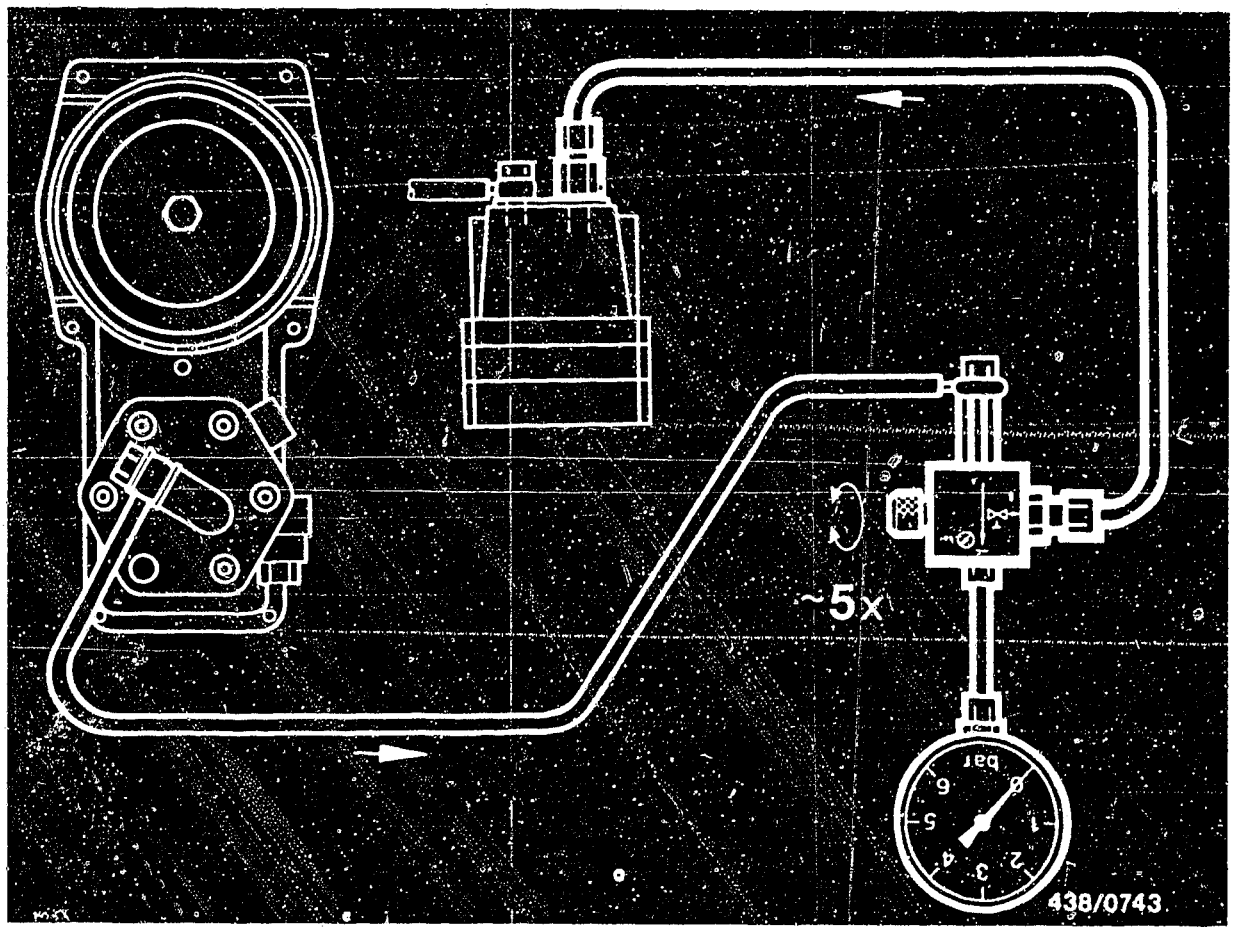
The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Install using connecting-parts set KDJE-P 100/12.

Screw the adapter (1) with seal ring onto the inlet fitting A or 3 of the directional-control valve.

Unscrew the control-pressure line (2) from the warm-up regulator and connect to the adapter with inlet-union screw M 10 x 1 and seal rings.

Screw the connecting piece (3) of the connecting-parts set into the warm-up connection port of the fuel distributor and connect to outlet fitting B or 1 of the directional-control valve via hose line (4).

Suspend the pressure gauge from the engine-compartment lid (possibly using a wire hook).



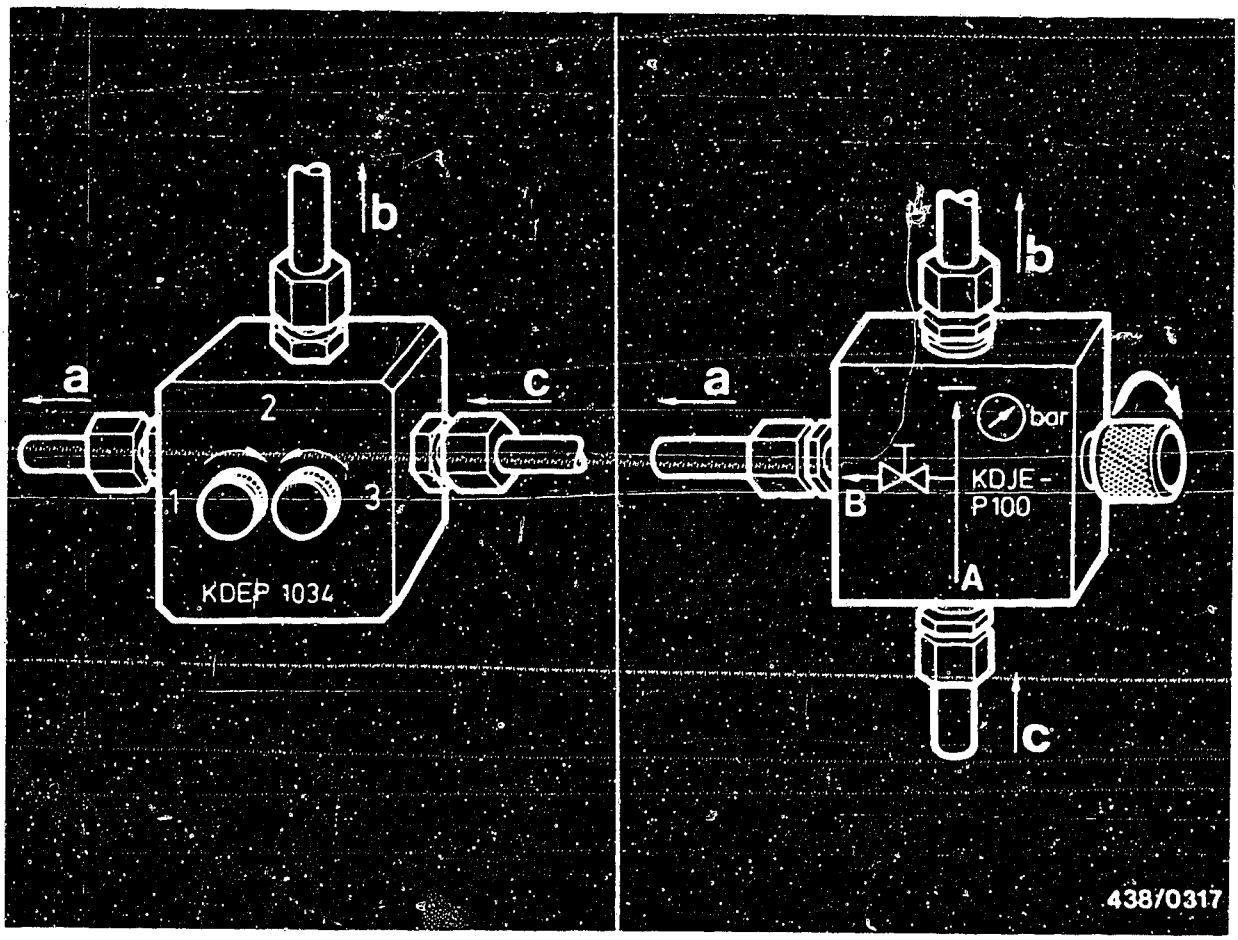
15.2 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electrical fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.3 Testing the primary pressure:

The test is performed with the engine switched off. The temperature of the engine is not important.

Close the valve screw of directional-control valve KDJE-P 100. In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Switch on the electric fuel pump by bridging the electrical safety circuit.

The pressure gauge now indicates the primary pressure.

Fuel distributor Part No.	Test specifications - primary pressure (gauge pressure)
0 438 100 135	5,1...5.8 bar (5,2...5.9 kgf/cm²)

Possible causes for too low a primary pressure:

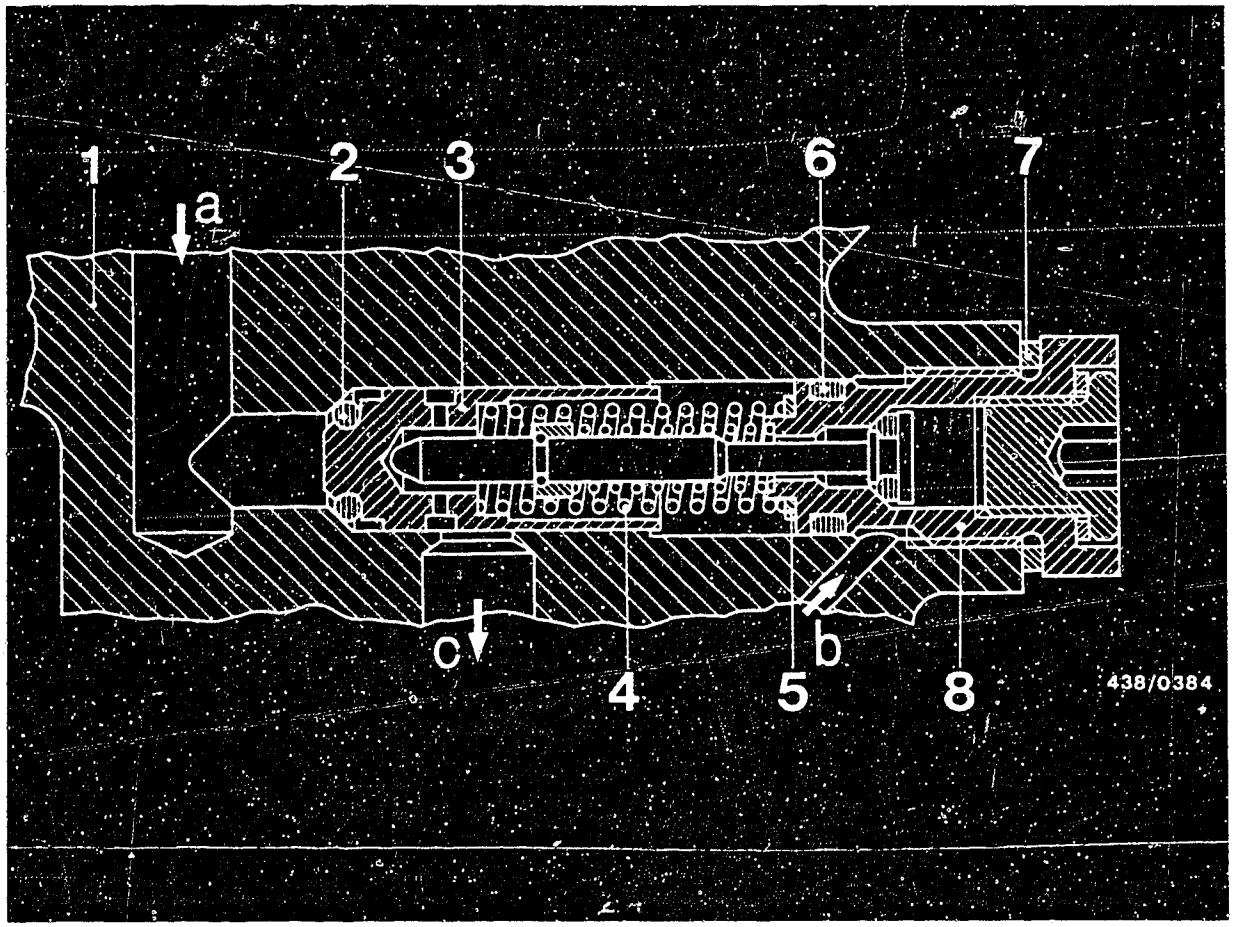
- Fuel supply faulty.
  (Delivery of electric fuel pump too low).

- Primary pressure set incorrectly.
  A precondition for readjustment of the primary pressure is always that the fuel supply is in order.
  Measure the fuel delivery. Test specification:
  950 cm³/30s.

  Possible causes for too high a primary pressure:

- A restriction in the return line leading to the fuel tank.

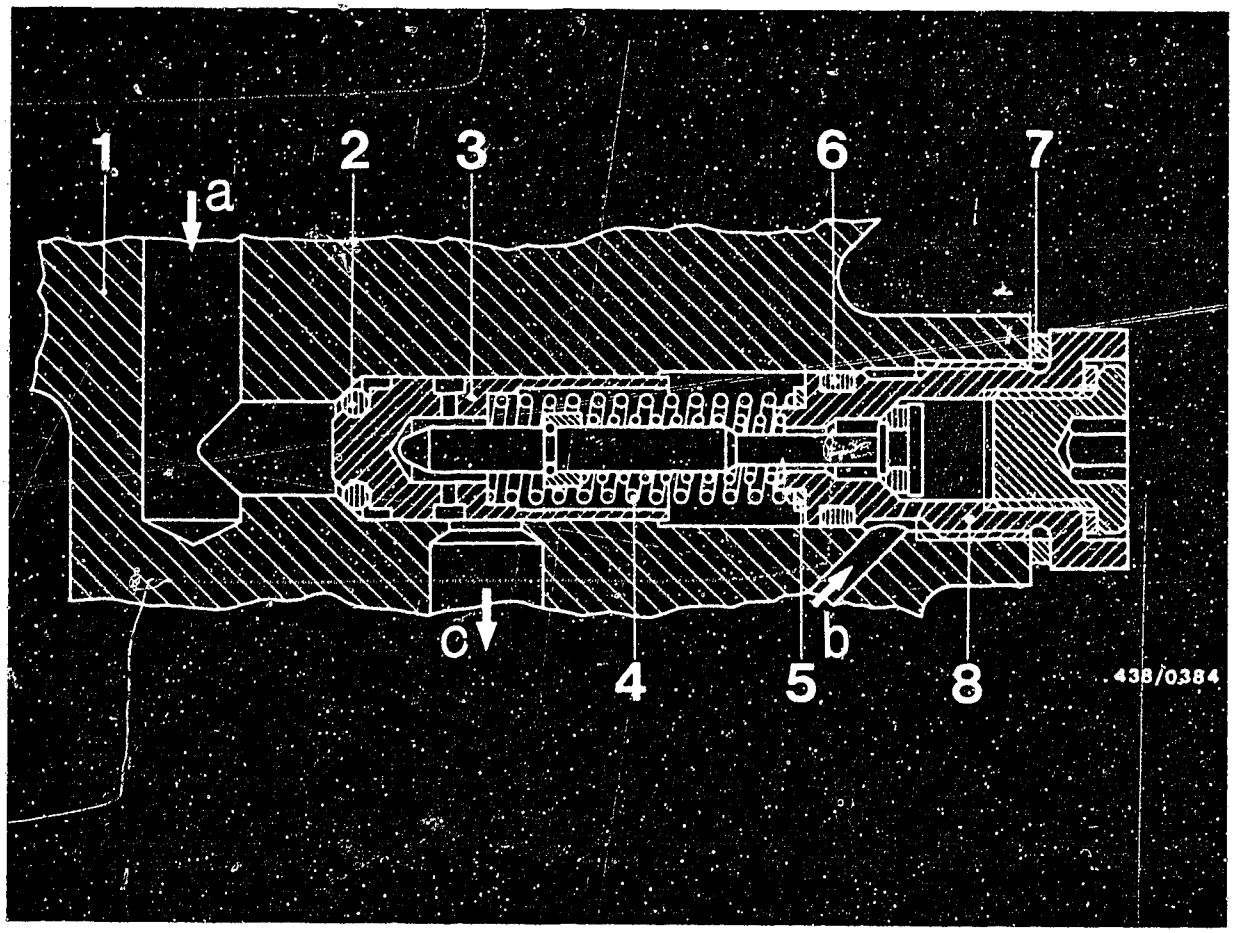
- Primary-pressure regulator set incorrectly.
  Before adjusting too high a primary pressure check the state of the return line to the fuel tank.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

15.4 Adjusting the primary pressure:

Fuel distributor Part No.	Adjustment values - primary pressure (gauge pressure)
0 438 100 135	5,3...5,5 bar (5,4...5,6 kgf/cm²)

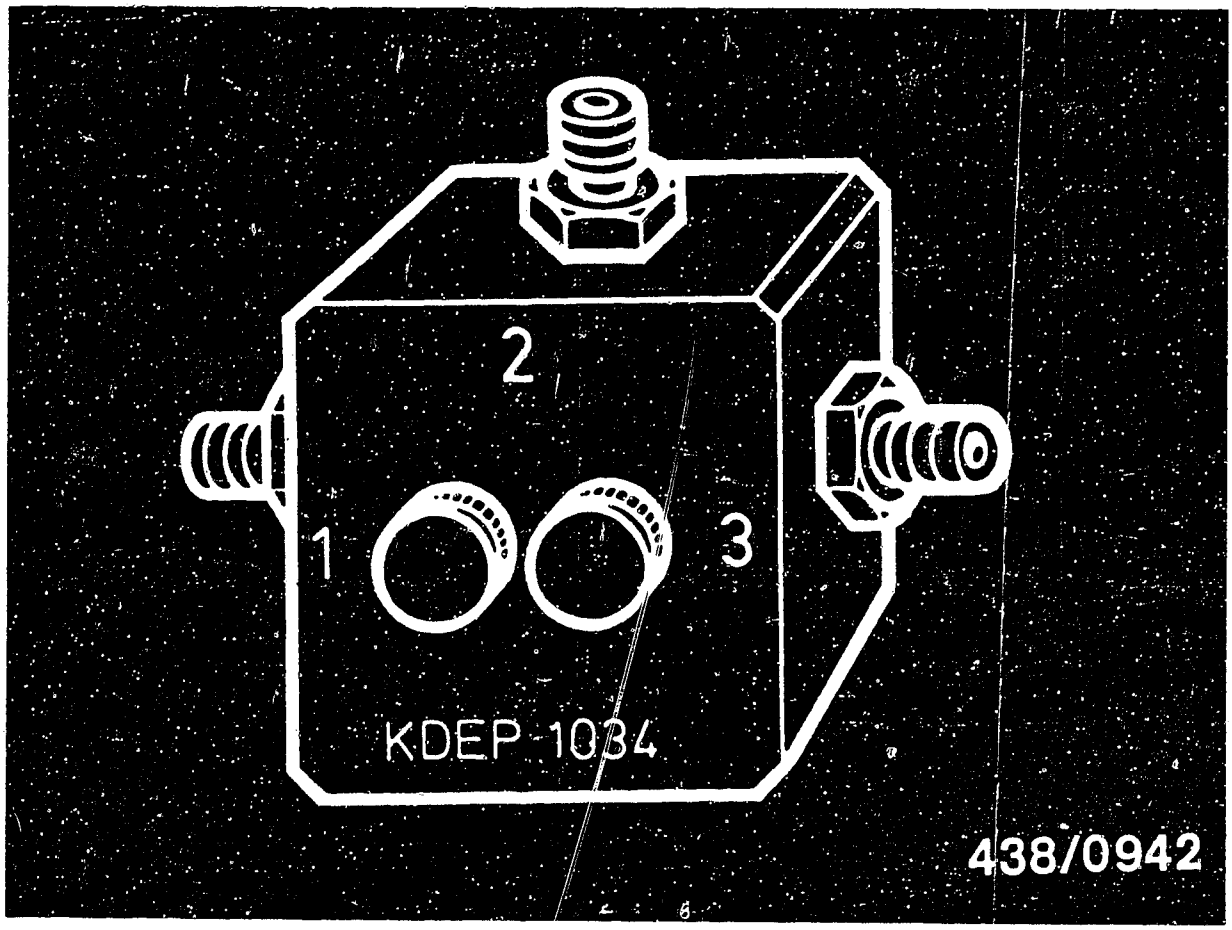


The primary pressure is readjusted by replacing the shims (Item 5).

Note:
0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 8) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 7) and O-ring (Item 6).

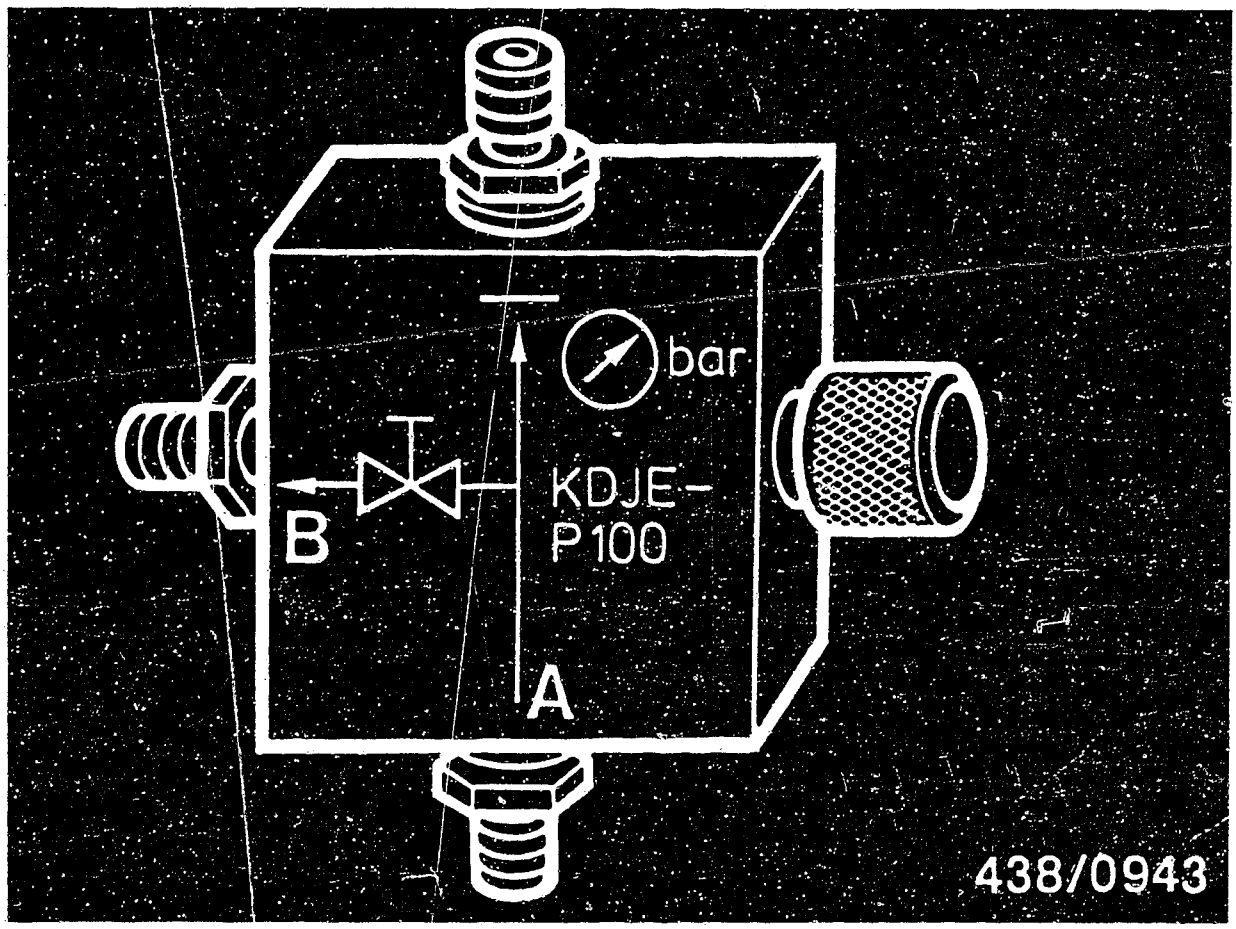
The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



16. Testing the entire fuel system for leaks.

16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered.

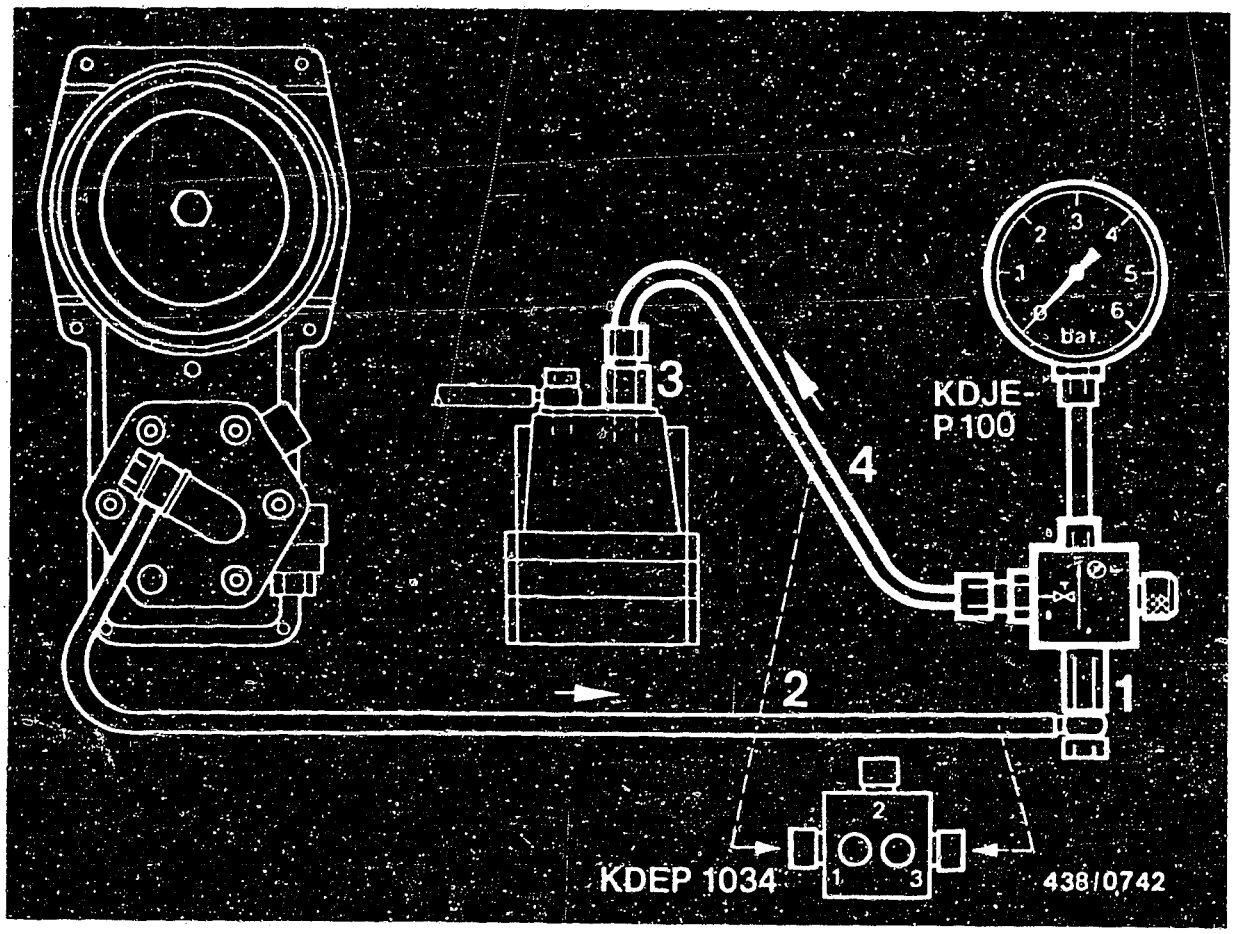


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw. The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:

When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



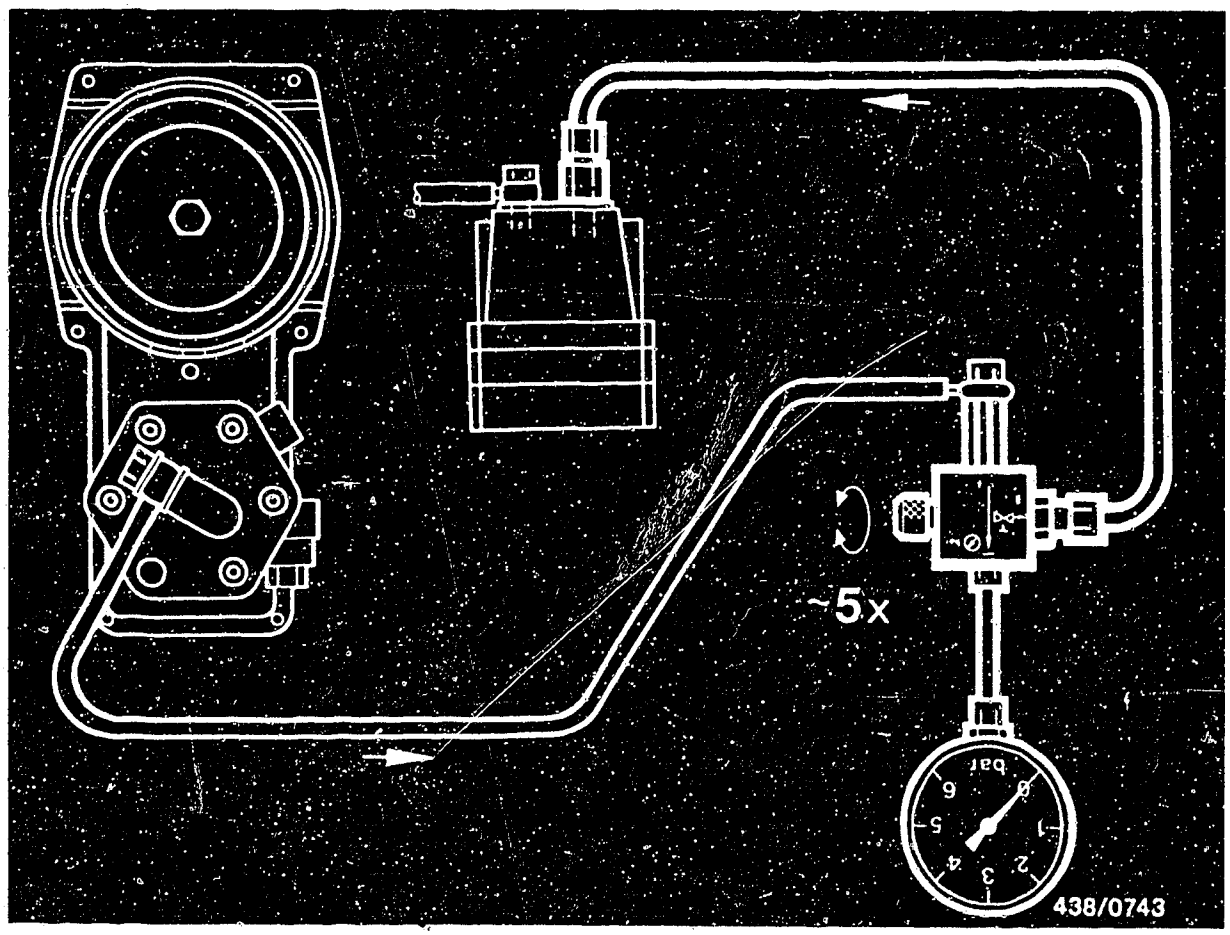
The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Install using connecting-parts set KDJE-P 100/12.

Screw the adapter (1) with seal ring onto the inlet fitting A or 3 of the directional-control valve.

Unscrew the control-pressure line (2) from the warm-up regulator and connect to the adapter with inlet-union screw M 10 x 1 and seal rings.

Screw the connecting piece (3) of the connecting-parts set into the warm-up connection port of the fuel distributor and connect to outlet fitting B or 1 of the directional-control valve via hose line (4).

Suspend the pressure gauge from the engine-compartment lid (possibly using a wire hook).

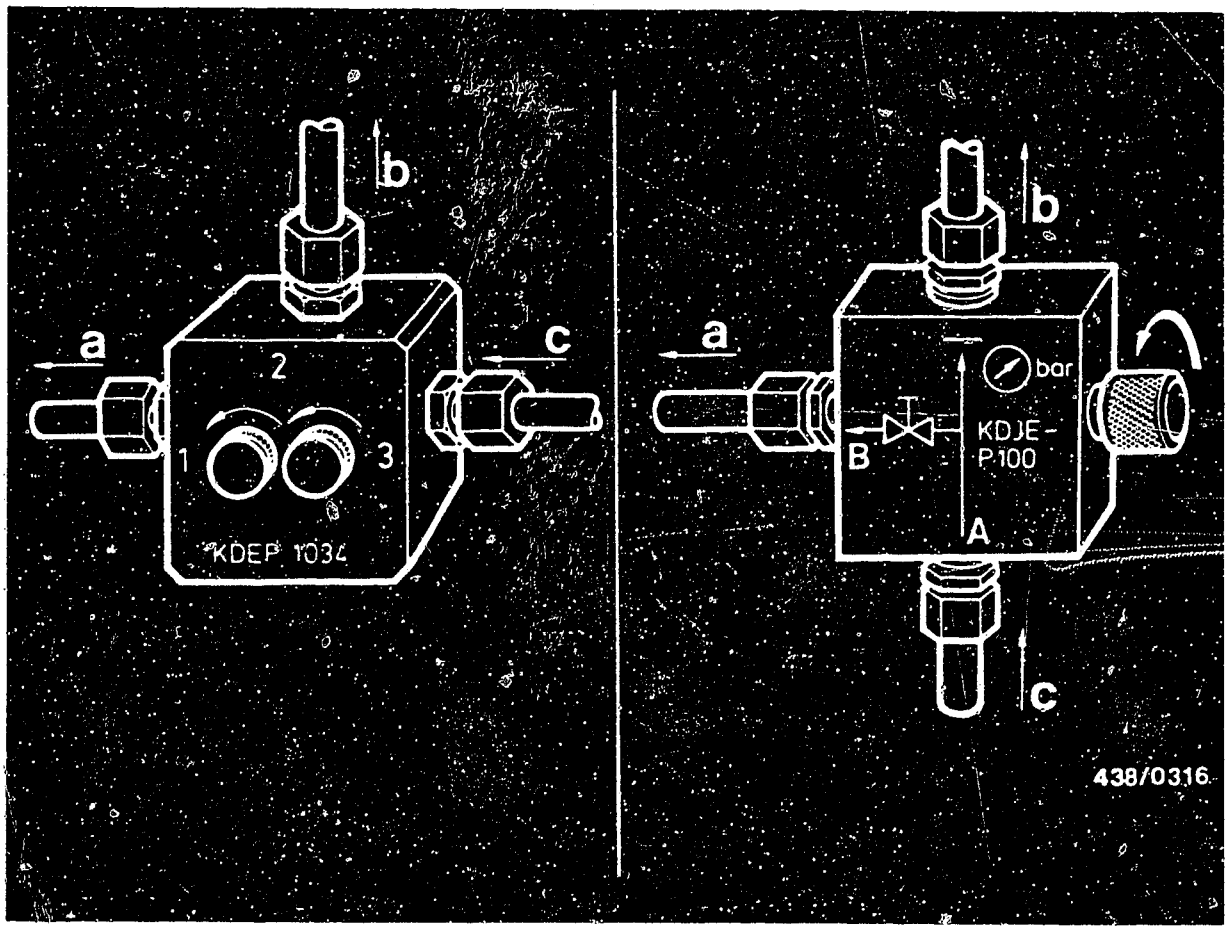


16.2 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended). Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034)(turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Leak test

The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

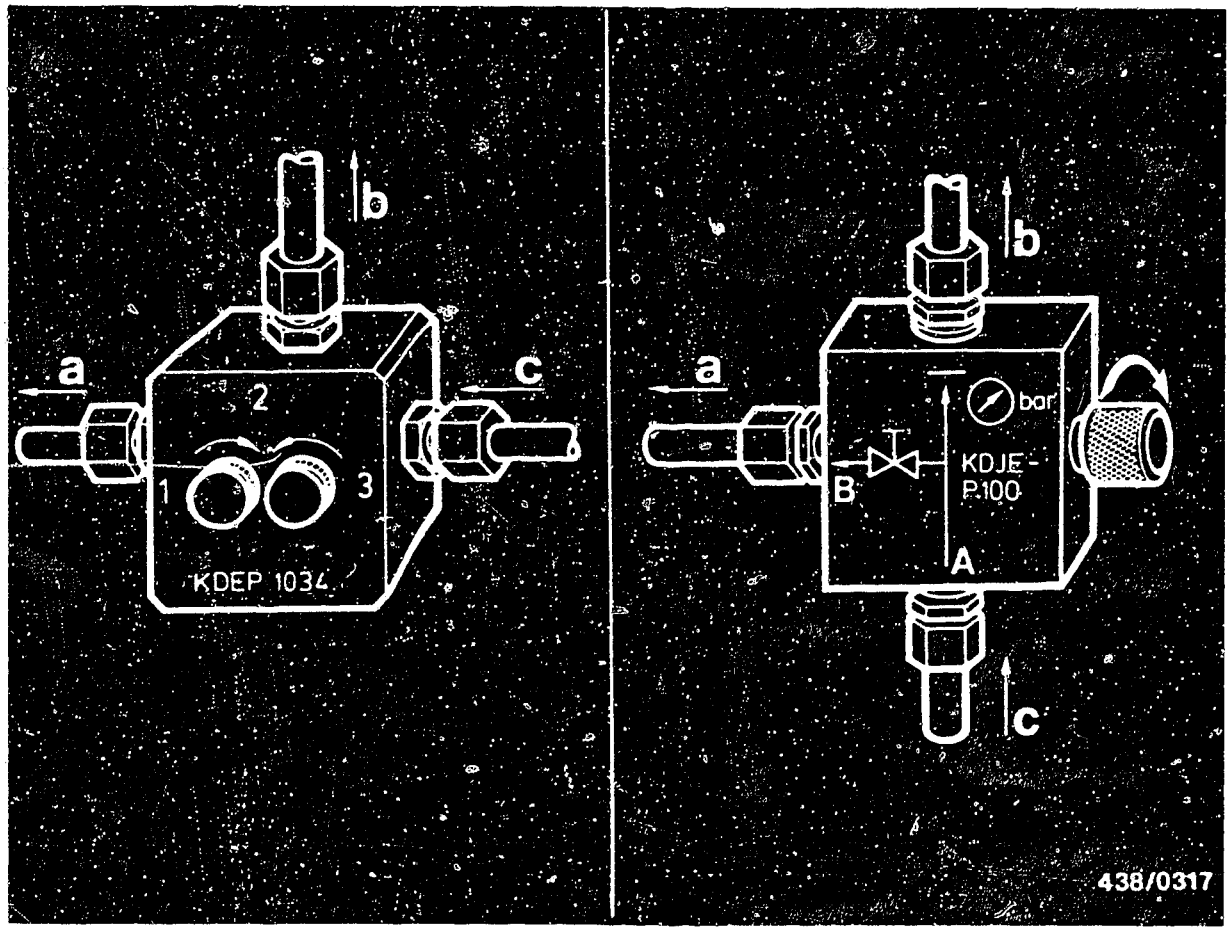
Test specifications for leak test:

With fuel accumulator
Part number:

0 438 170 040
0 438 170 041

Minimum pressure after:

10 minutes	2.5 bar	(2.6 kgf/cm³) gauge pressure
20 minutes	2.4 bar	(2.5 kgf/cm³) gauge pressure.

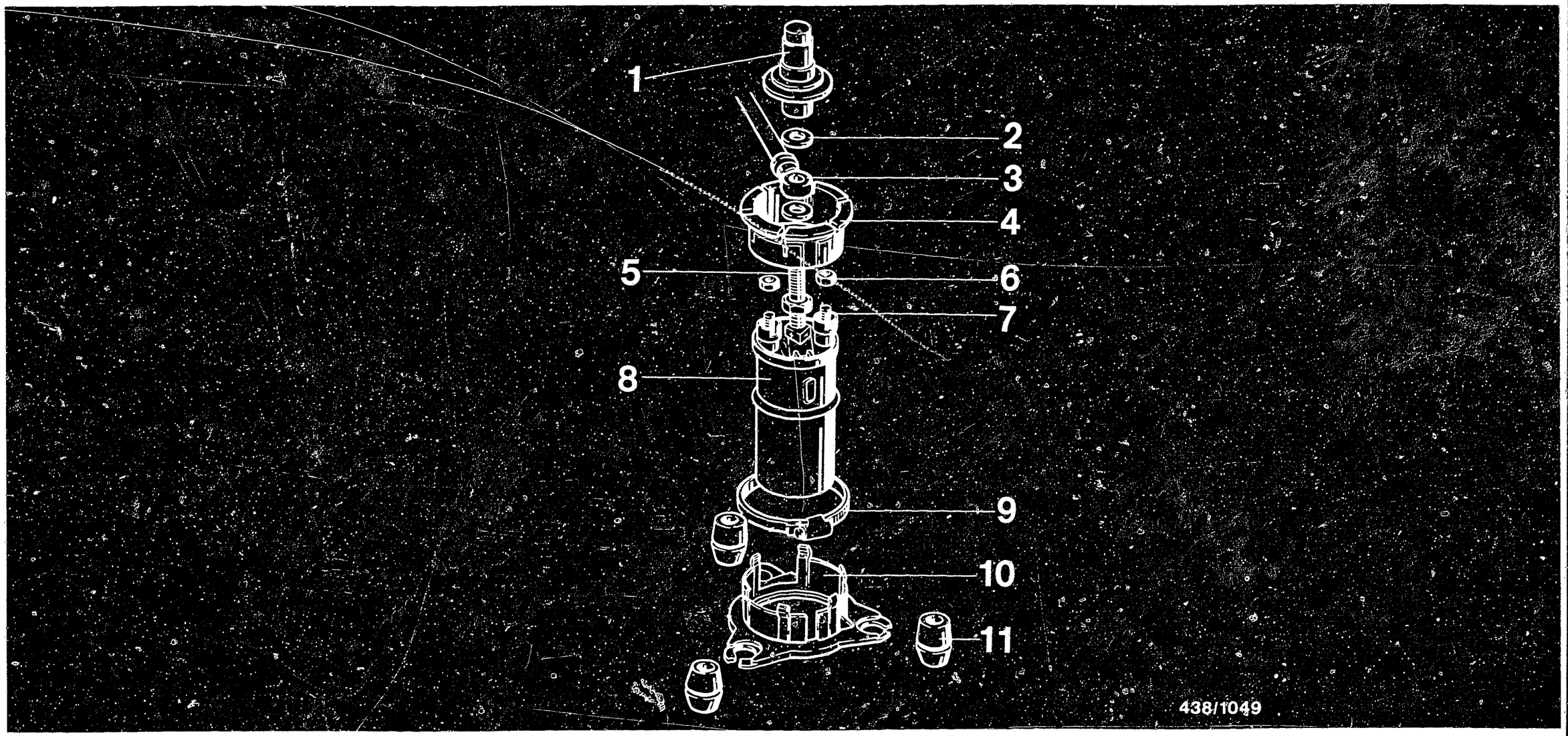


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.

If the same result is found, the leak is in the primary-pressure circuit.
If the test results are correct during the second test, the leak is in the control-pressure circuit.



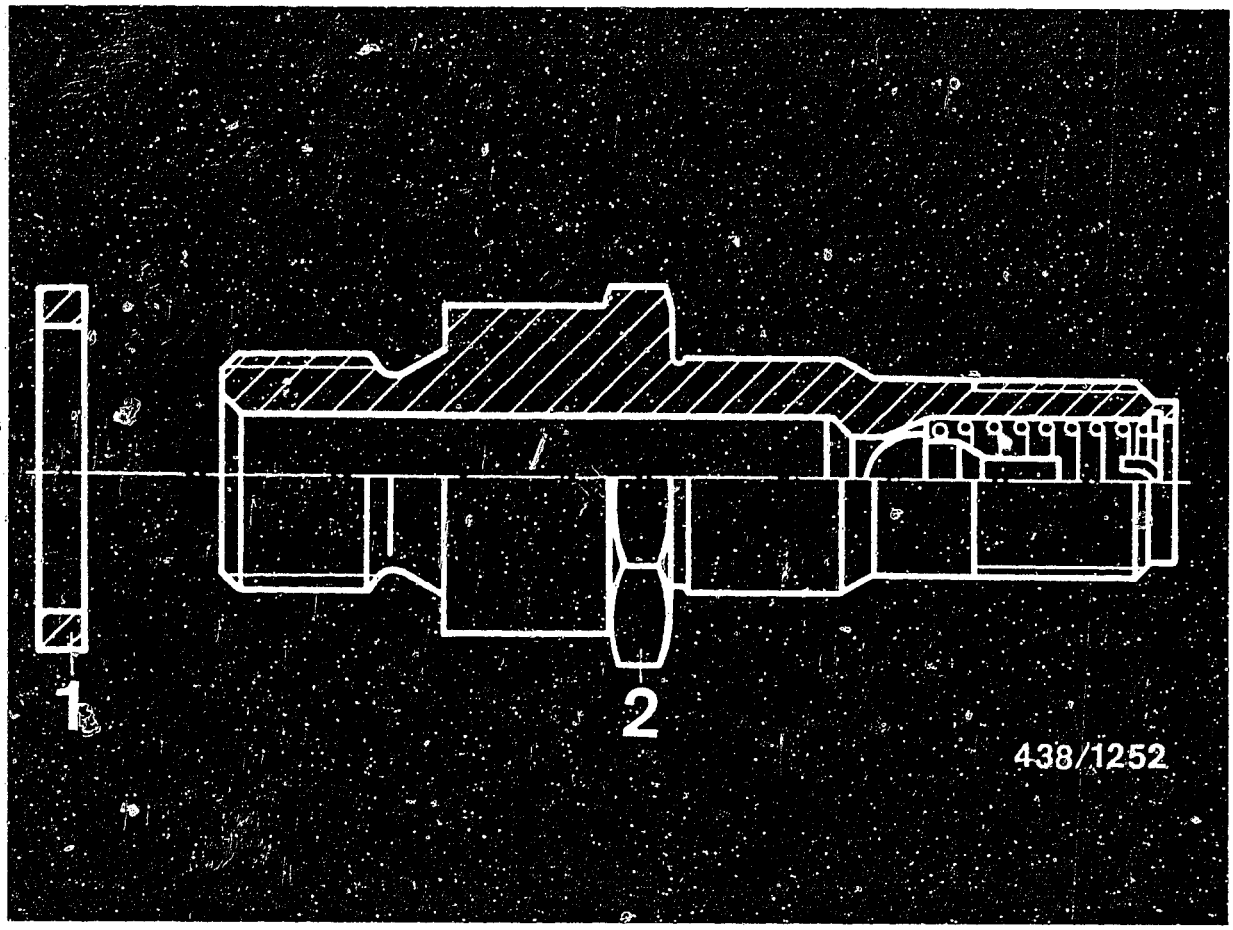
1 = Pressure damper
2 = Seal ring
3 = Flow line
4 = Clamping sleeve
5 = Non-return valve
6 = Hexagon nut
7 = Electrical connections
8 = Electric fuel pump
9 = Hose clamp
10 = Holder
11 = Rubber mounting

16.4 Possible causes of trouble in primary-pressure circuit:

- Non-return valve in tube fitting of intank electric fuel pump leaking

Part number of electric fuel pump: 0 580 254 005 / 0 580 254 006

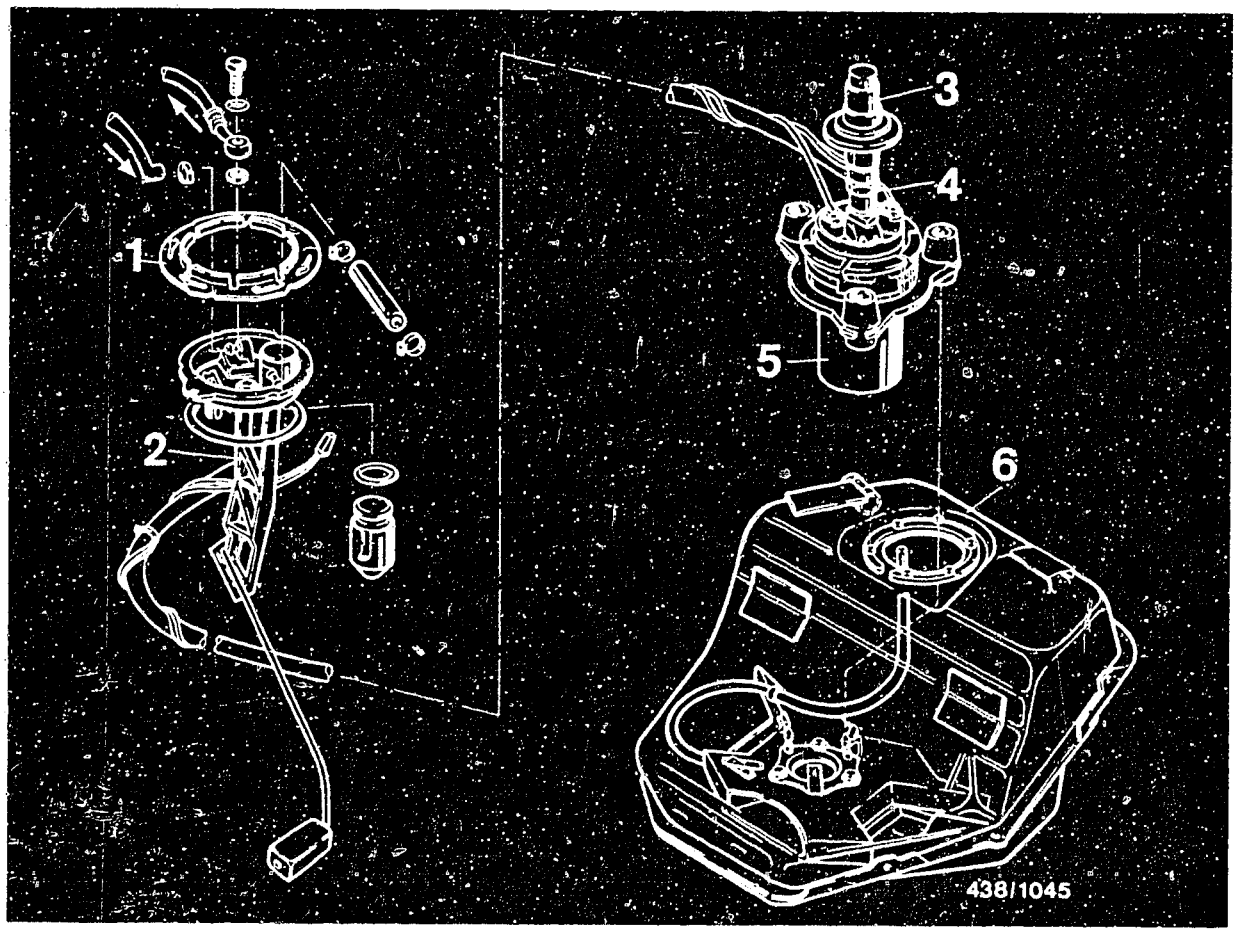
The non-return valve is integrated in the tube fitting.



1 = Tube-fitting with built-in non-return valve
2 = Flat seal ring

Parts set: 1 587 010 502

If necessary, replace the tube fitting from the parts set 1 587 010 502 as follows:



1 = Closure ring
2 = Fuel tank sender
3 = Pressure damper
4 = Non-return valve
5 = Electric fuel pump
6 = Fuel tank

Remove closure ring and take out fuel tank sender.

Withdraw complete unit (electric fuel pump, non-return valve and pressure damper) from ratchet springs on base of fuel tank.

Unscrew pressure damper and remove flow line with flat seal rings.

Unscrew tube fitting with defective non-return valve.

Screw new tube fitting (short end) with thick flat seal ring into the delivery fitting and tighten to a torque of 17 ... 25 Nm.

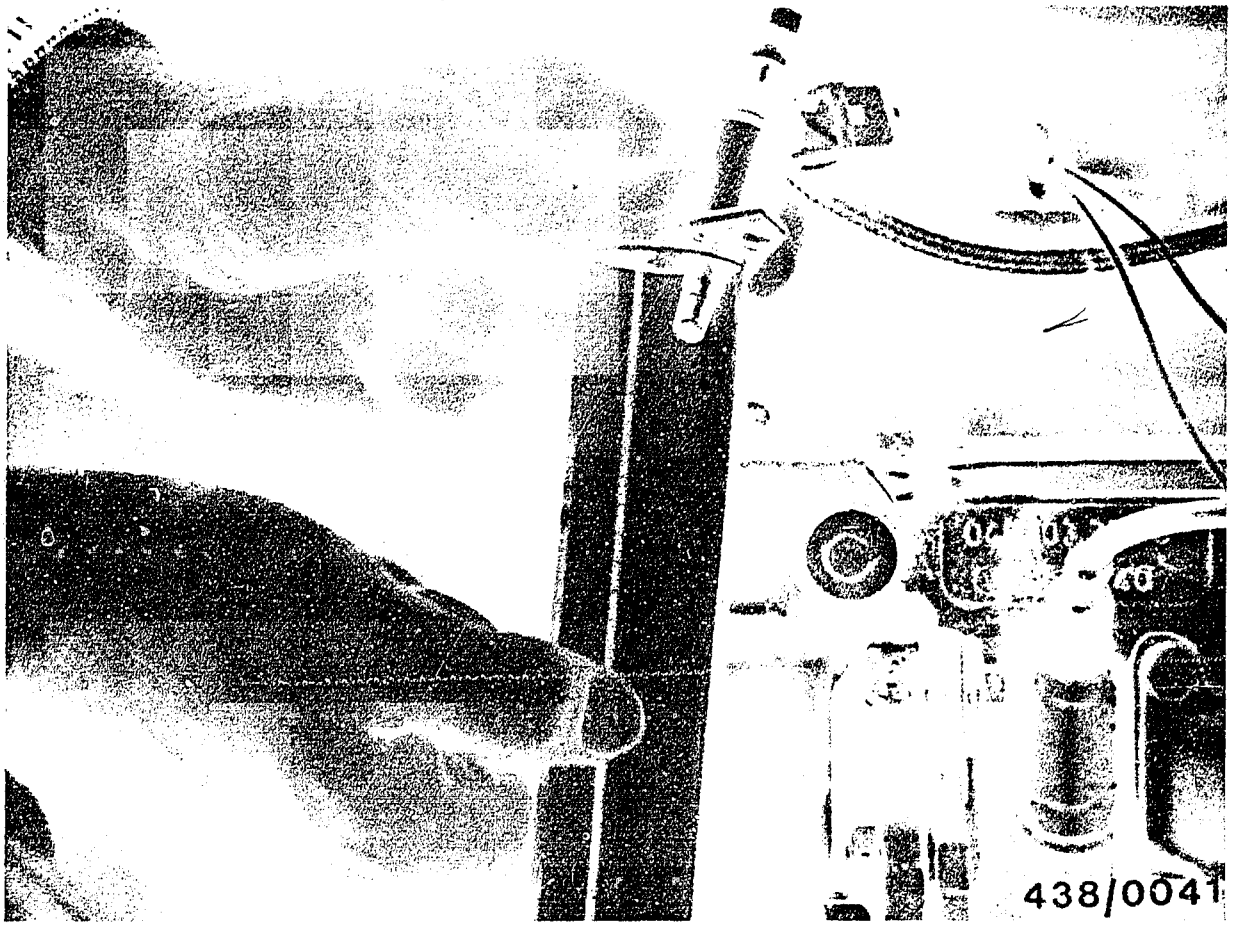
Hold the hexagonal section of the delivery fitting with a wrench.

Fit thin flat seal ring, inlet union of fuel line and other flat seal ring onto the long side of the tube fitting and tighten by means of pressure damper.

Tightening torque 17 ... 25 Nm.

Re-install complete unit, making sure that the electric fuel pump is correctly positioned.

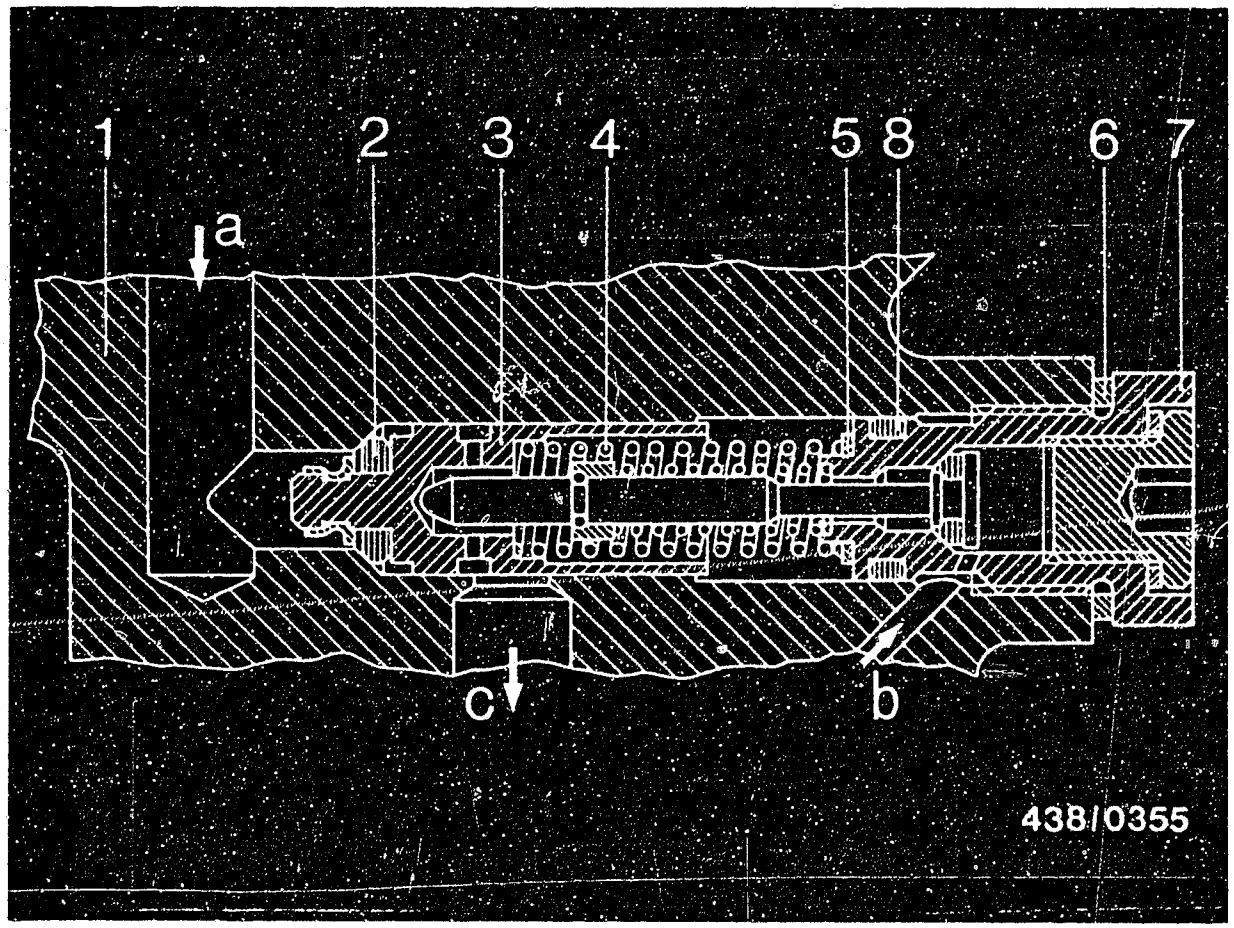
Danger of kinking fuel lines.



- The cold-start valve has a leak

Remove cold-start valve. Hose line remains connected.

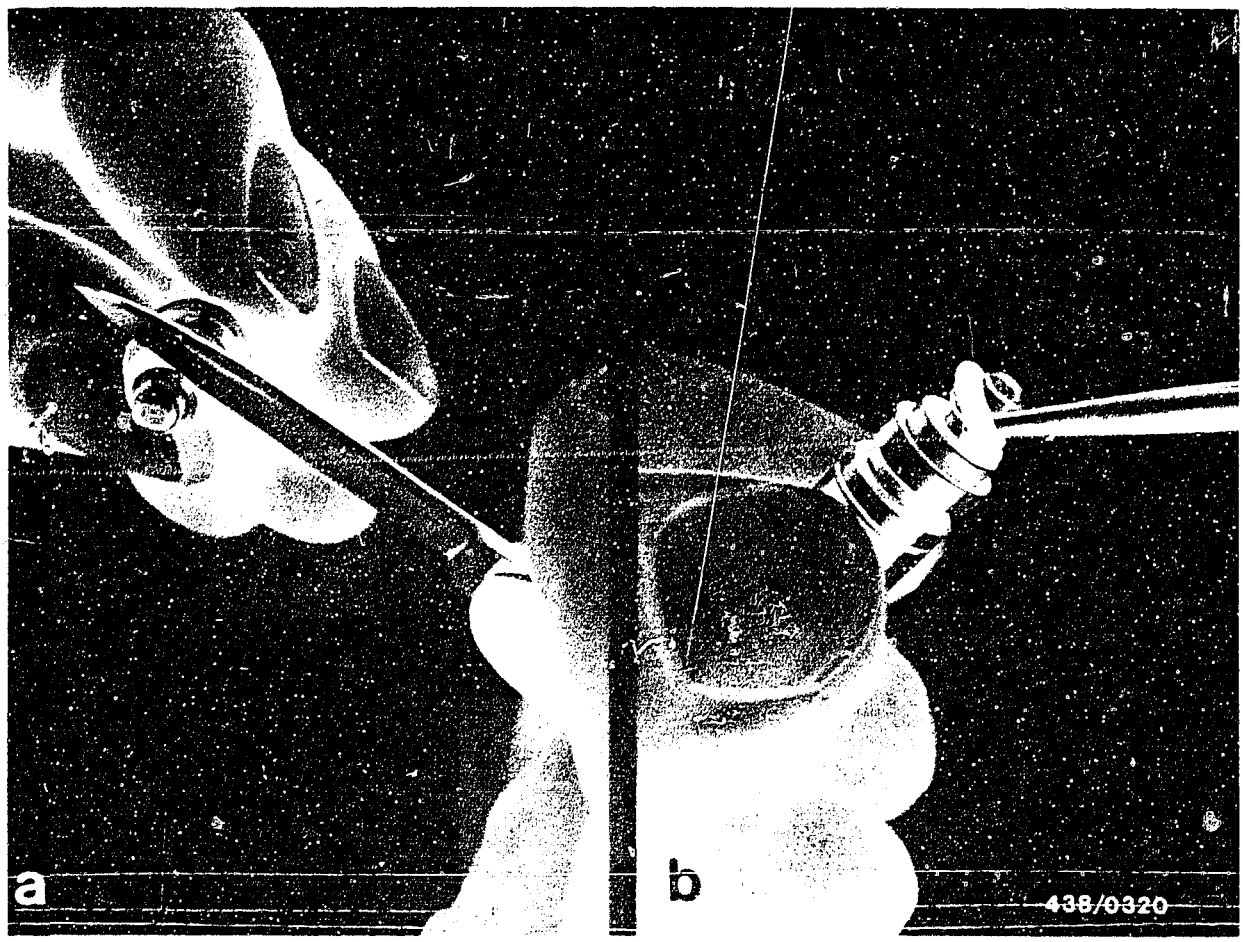
Hold start valve in a suitable container (e.g. graduate).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Dry off the nozzle of the cold-start valve.
No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.
Switch the electric fuel pump off again.
Replace the cold-start valve if leaky.
Finally, adjust idle speed with the engine at operating temperature. See Coordinates F 8.



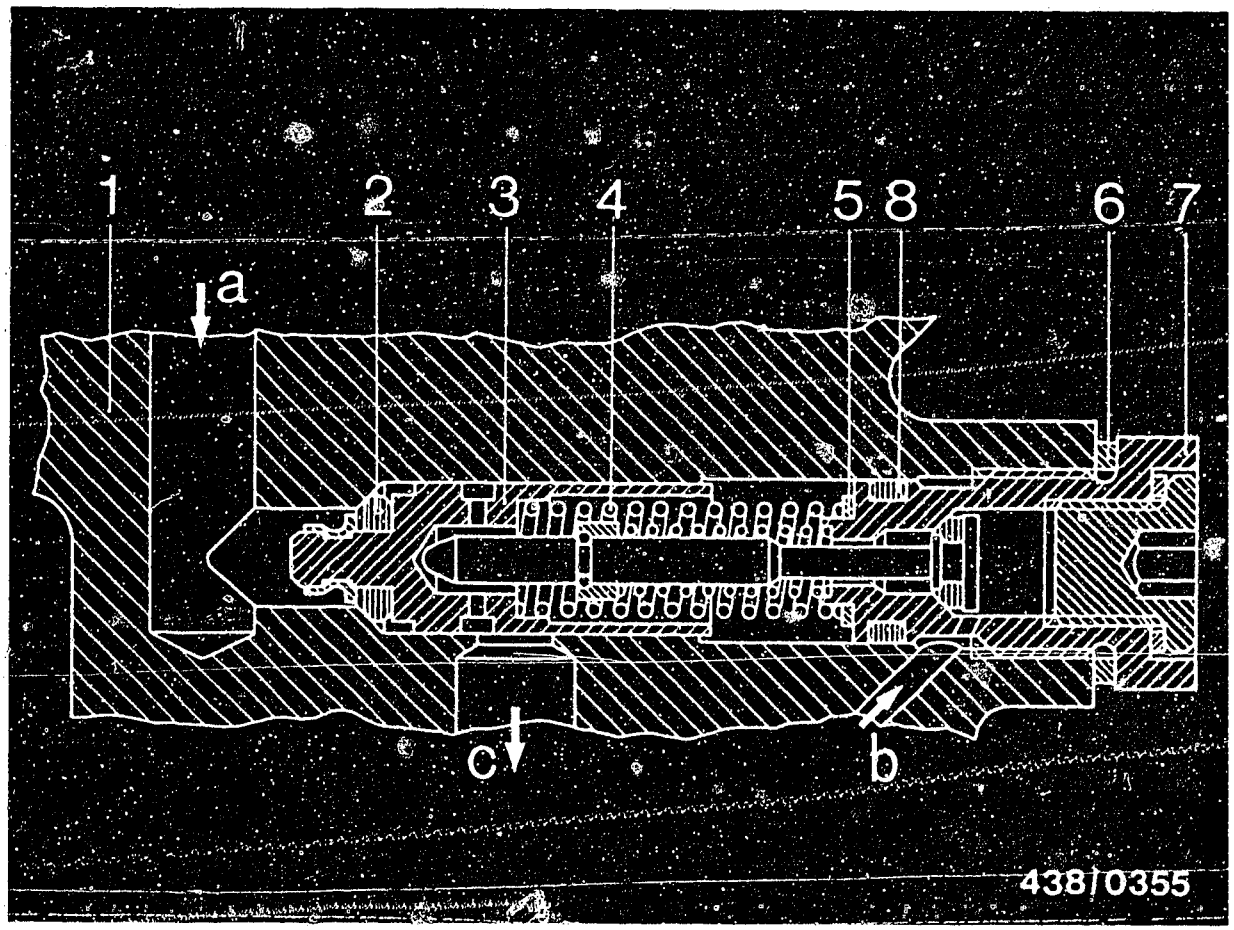
a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = Shaped seal ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug
8 = O-ring

- Shaped seal ring on control piston of primary-pressure regulator leaking.

Replacing the shaped seal ring:
Clean the fuel distributor in the area of the primary-pressure regulator. Unscrew large screw plug (7) with complete push-up valve. Also remove shims (5), control spring (4) and control piston (3).



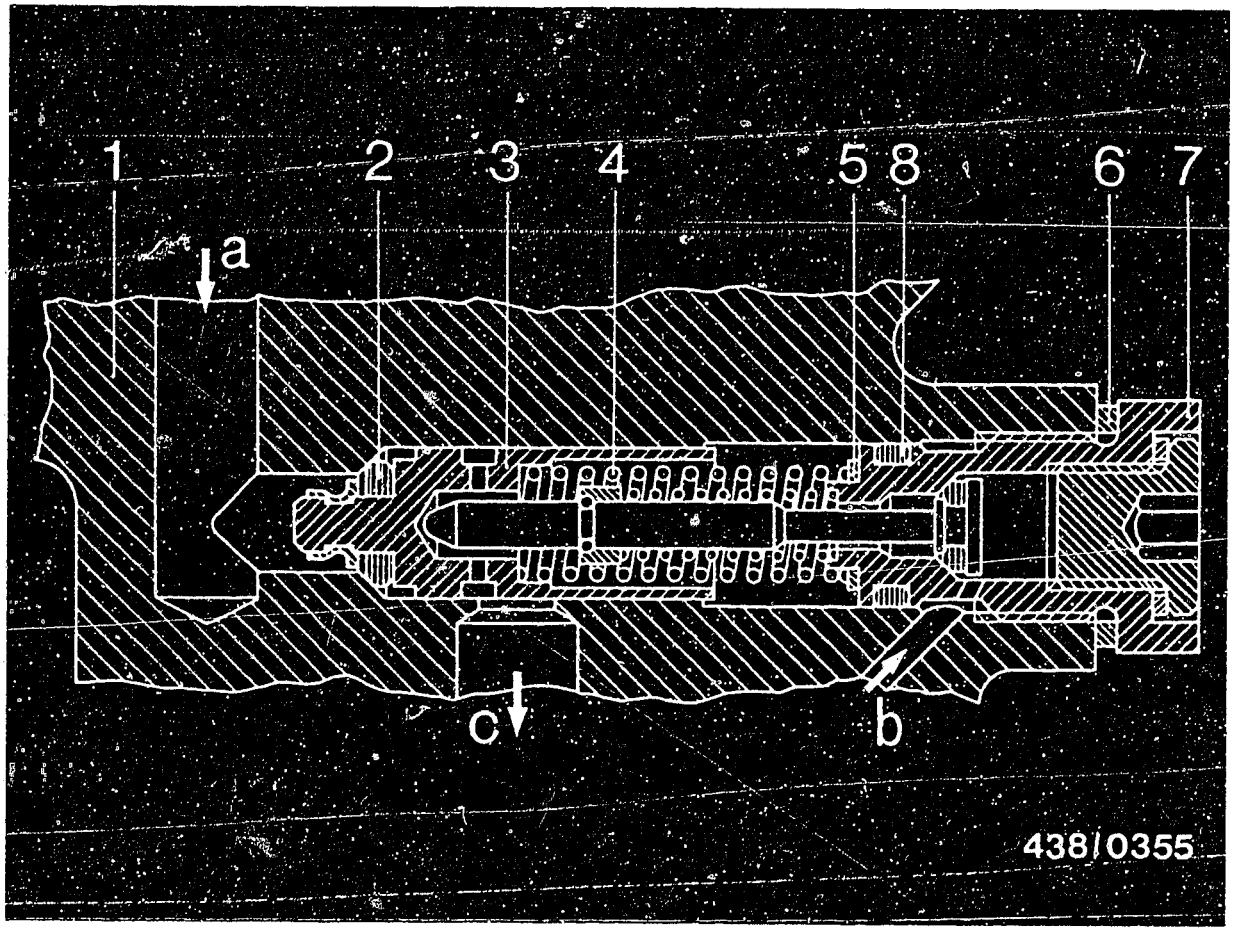
The seal ring is replaced without removing the retaining ring:
Cut open the old seal ring and remove (Fig. a).
Slip the new seal ring over the retaining ring using a blunt marking tool (Fig. b). Do not overstretch the seal ring when doing this.
Then carefully check whether the seal ring has been fitted without being damaged. It must be possible to turn the retaining ring by hand. Between retaining ring and seal ring there must be a clearance of approx. 0.2 mm.



Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Primary pressure, test specifications and settings (gauge pressure)

Fuel distributor Part No.	Test specification:	Setting value:
0 438 100 135	5.1...5.8 bar (5.2...5.9 kgf/cm²)	5.3...5.5 bar (5.4...5.6 kgf/cm²)

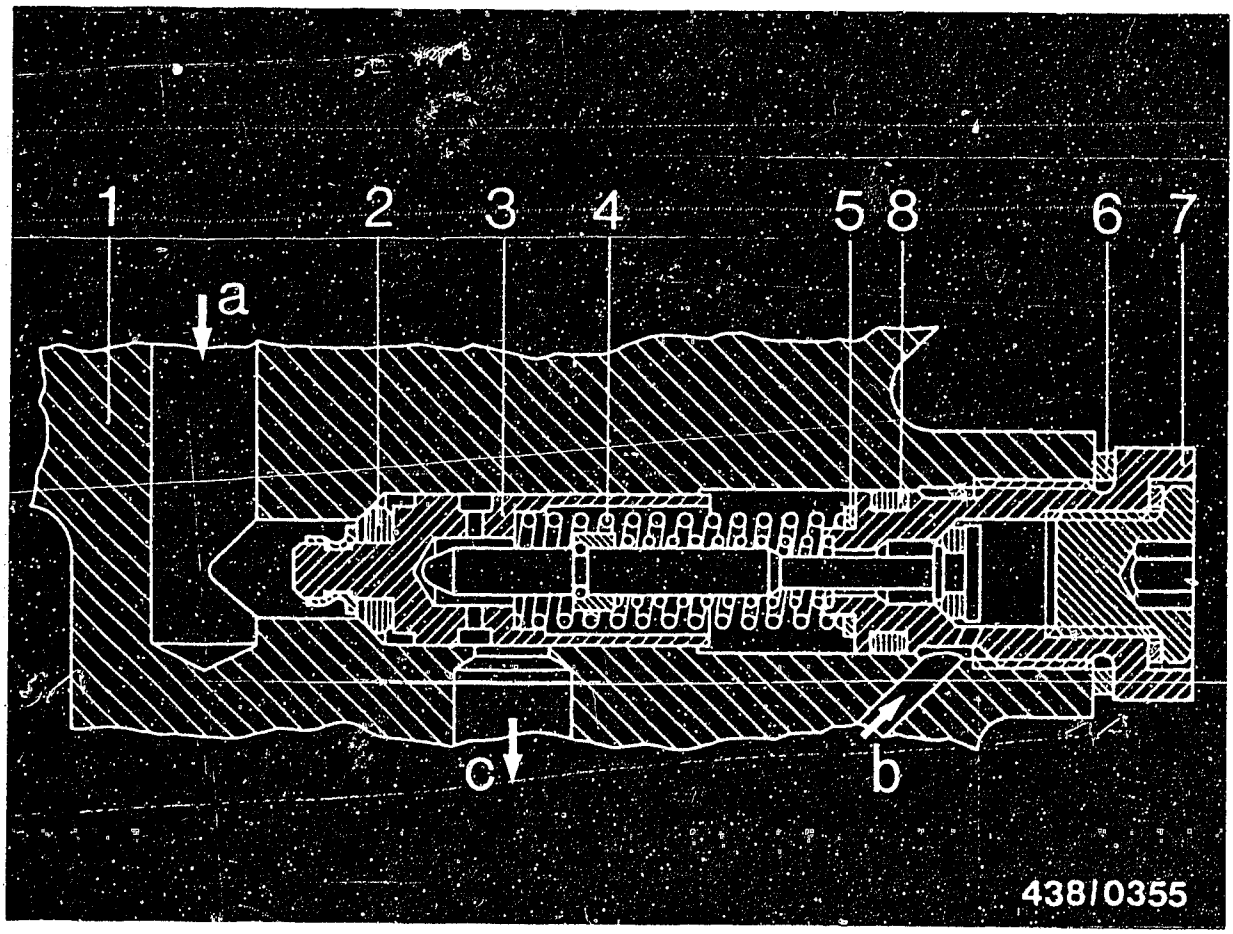


a = Primary pressure
b = From warm-up regulator
c = Fuel return

1 = Fuel-distributor housing
2 = Shaped seal ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug
8 = O-ring

16.5 Possible cause of trouble in the control-pressure circuit

Push-up valve in primary-pressure regulator leaking. The seal ring in the push-up valve is rigidly vulcanized onto the valve needle.



If there is a leak, therefore, it is necessary to replace the complete push-up valve (ready-assembled unit).

Clean the fuel distributor in the area of the primary-pressure regulator. Unscrew the large screw plug (7) with the complete push-up valve. Pay attention to the control spring (4) and shims (5).
Screw in the new push-up valve with the previously found number of shims (5), a new O-ring (8) and flat seal ring (6).
Then check the primary pressure once again and, if necessary, adjust by changing the shims (5).

Primary pressure, test specifications and settings (gauge pressure)

Fuel distributor Part No.	Test specification:	Setting value:
0 438 100 135	5.1...5.8 bar (5.2...5.9 kgf/cm²)	5.3...5.5 bar (5.4...5.6 kgf/cm²)

17. Testing the injection valves.

Remove the injection valves for testing.
When loosening the fuel lines, apply counter-force at the fixed hexagon of the injection valves.

When re-installing the injection valves, replace the O-rings on the valve stem if possible, part no. 3 430 210 600, to prevent leaks and entry of unmetered air.
In addition, the insulating sleeves should be tested for leaks. If necessary, tighten using Allen wrench (AF = 11 mm).

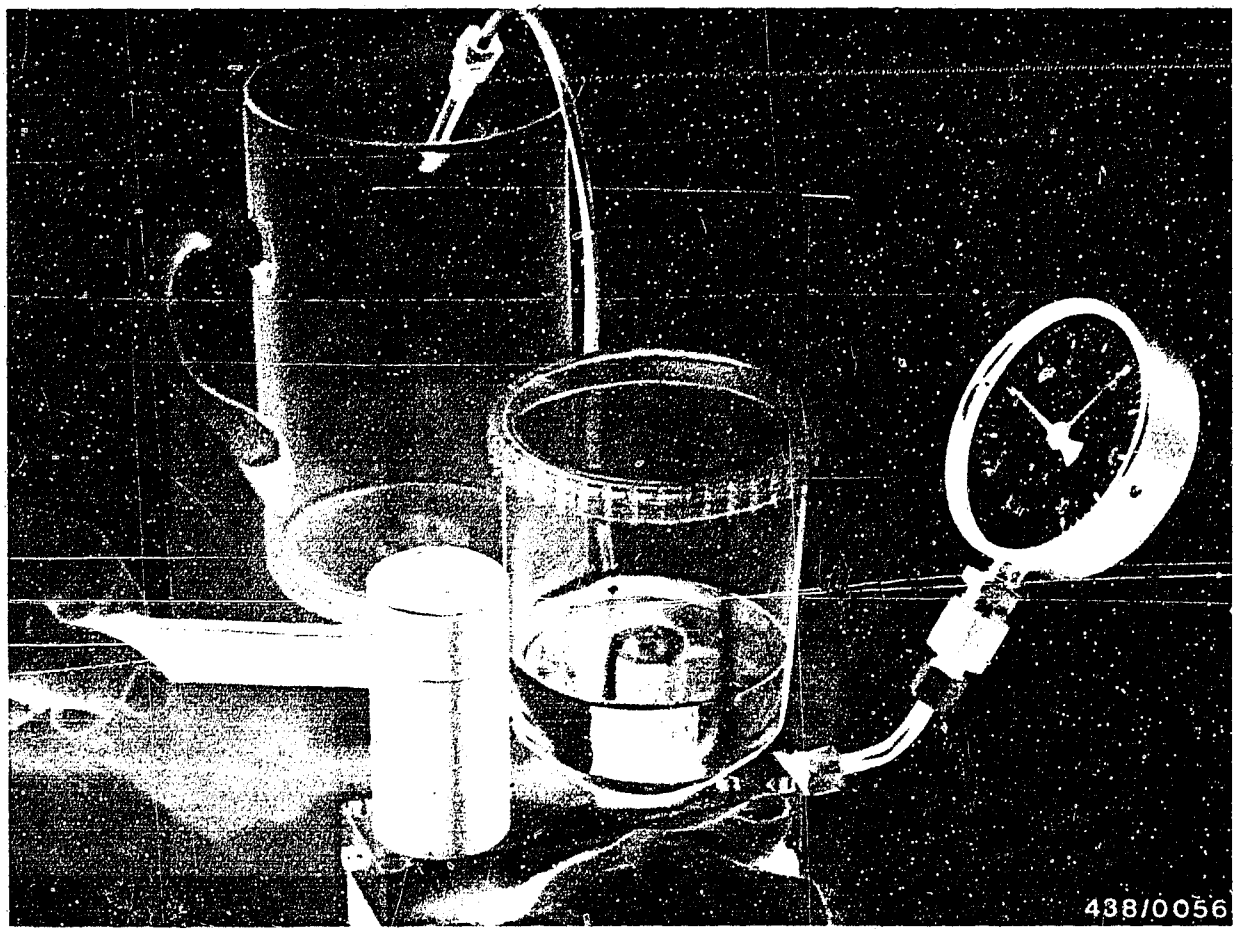
17.1 Test equipment and test media

The following testing specification refers to valve testers KDJE-P400 (previously KDEP 7452) and 0 681 200 700.

Observe the test-media specification!

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch Part No. VS 14 942-CH
Former Part No. 5 973 340 650
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.

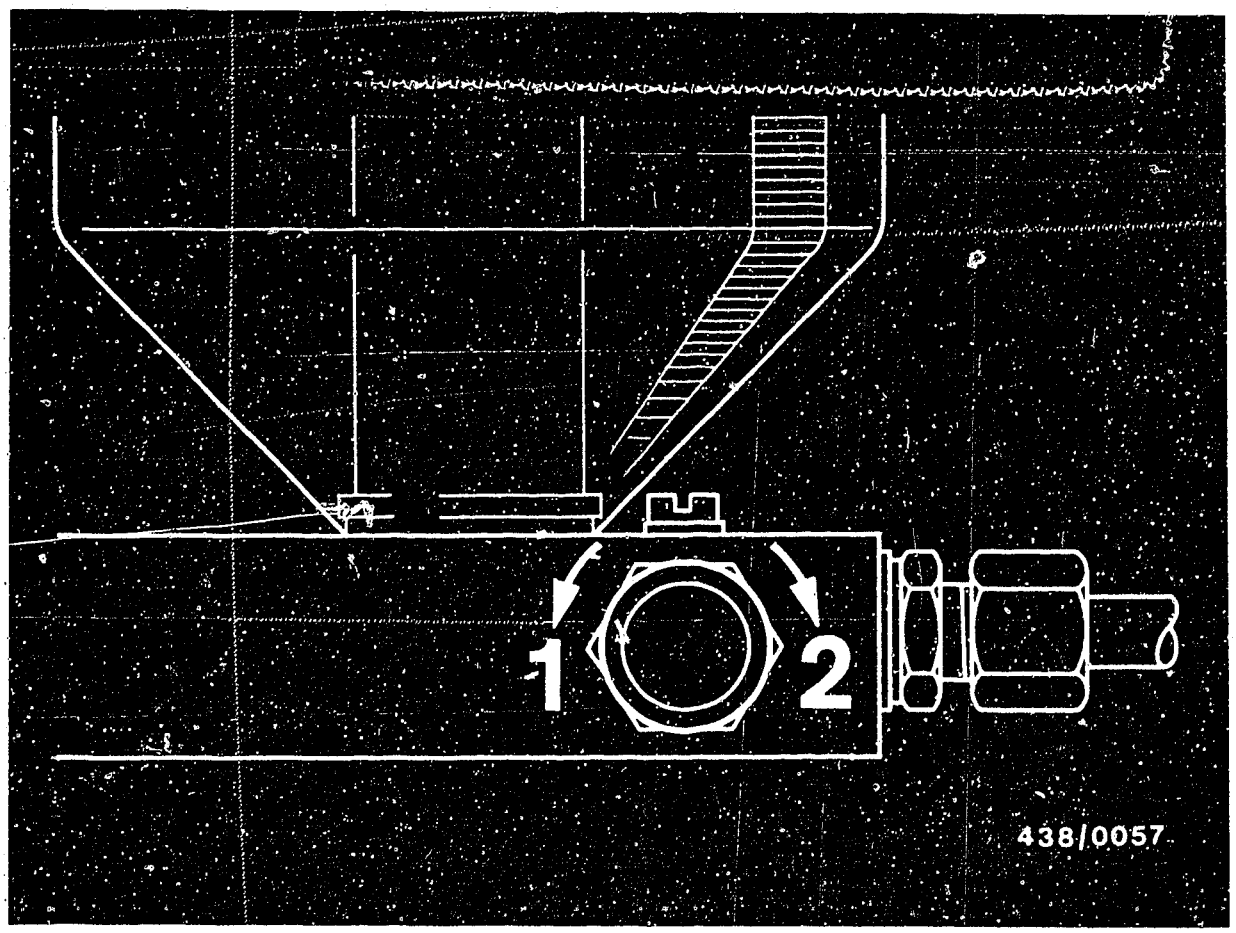


17.2 Connecting the injection valve to the tester

Connect the injection valve to the valve tester and bleed the delivery line by operating the lever several times with the union nut open. Then tighten the union nut.

17.3 Checking for dirt

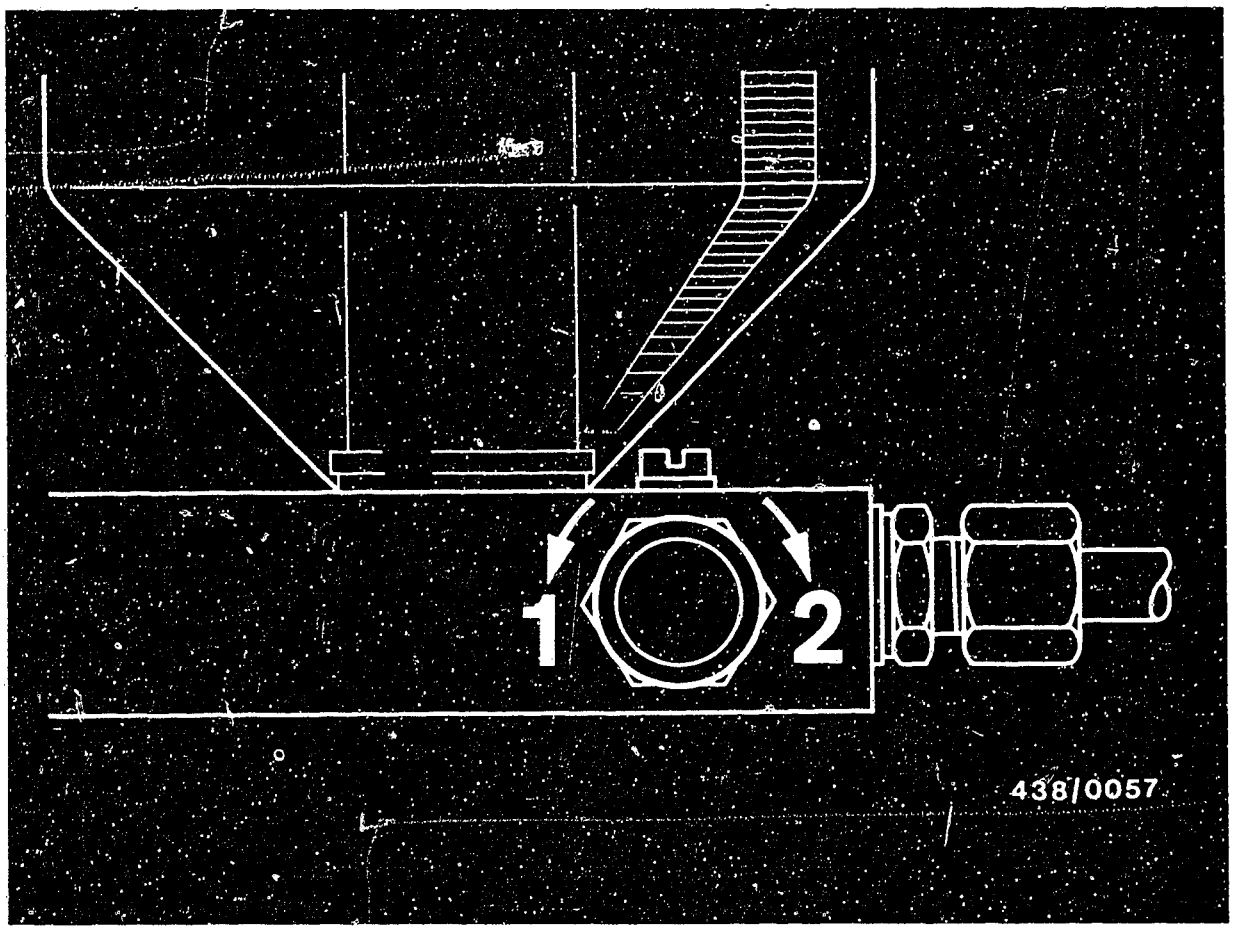
Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).
You can try to flush the injection valve clear by moving the lever back and forth several times strongly.
If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.



1 = Open 2 = Closed

17.4 Testing the opening pressure

Injection valve Part No.	Test specifications - opening pressure (Gauge pressure)
0 437 502 028 0 437 502 029	3.0...4.1 bar (3.1...4.2 kgf/cm²)



With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).

If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

17.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.8 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 20 seconds.

438/0058

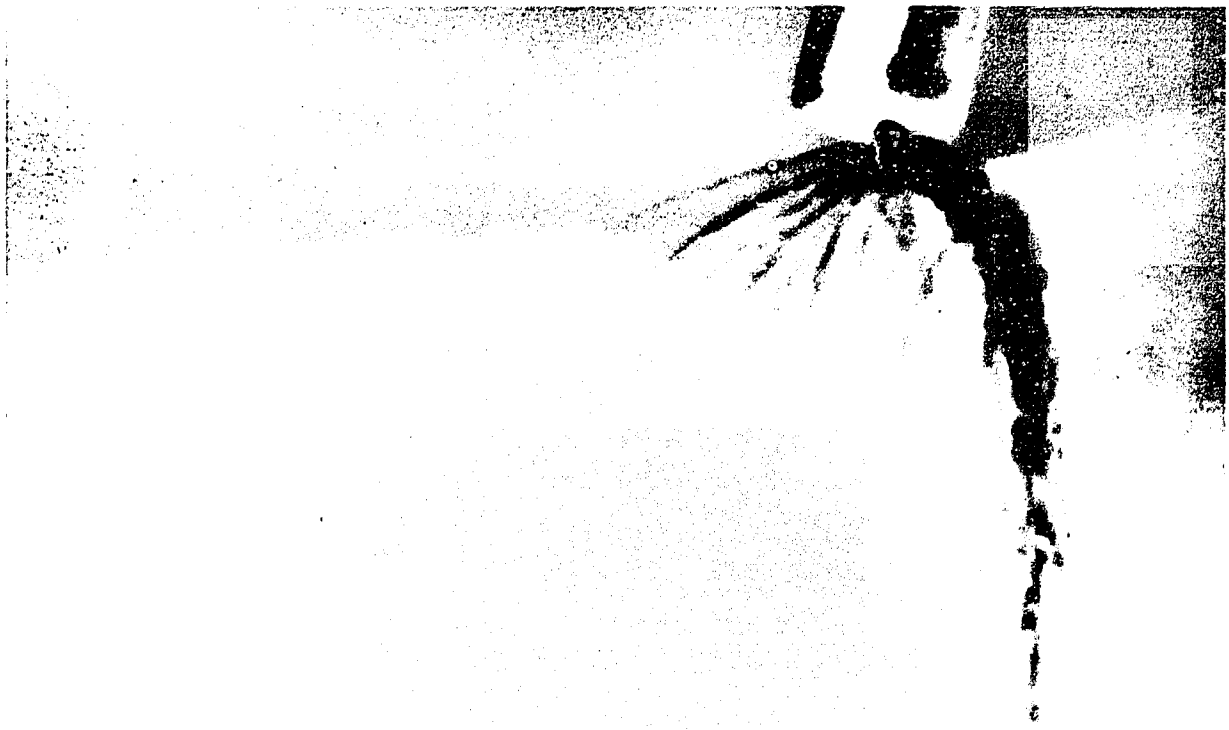
17.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.

43810059

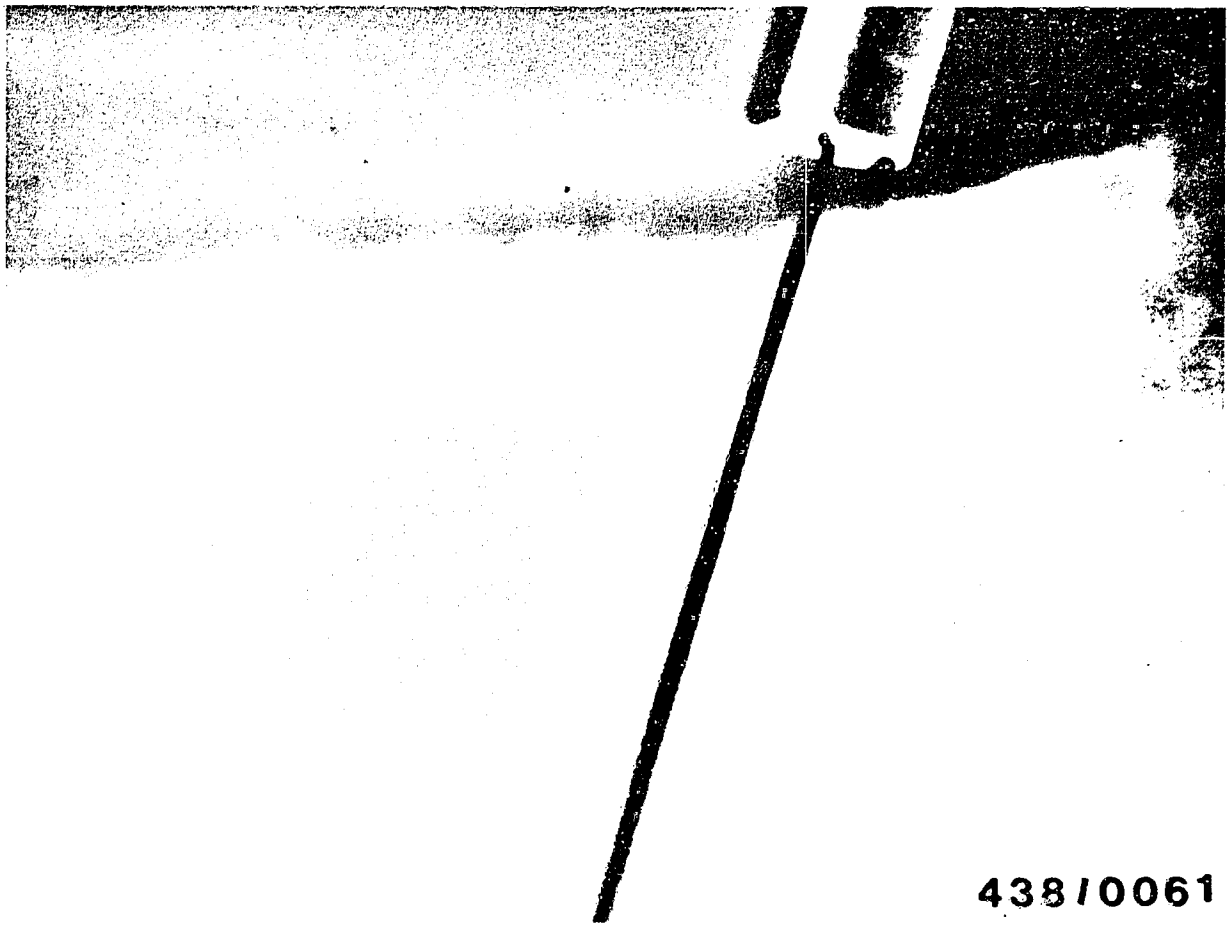
Illustration shows single-sided but nevertheless good spray formation.



438/0060

Poor spray formation; replace injection valves.

Illustration shows drop formation.



438/0061

Poor spray formation; replace injection valves.

Illustration shows "cord" spray.

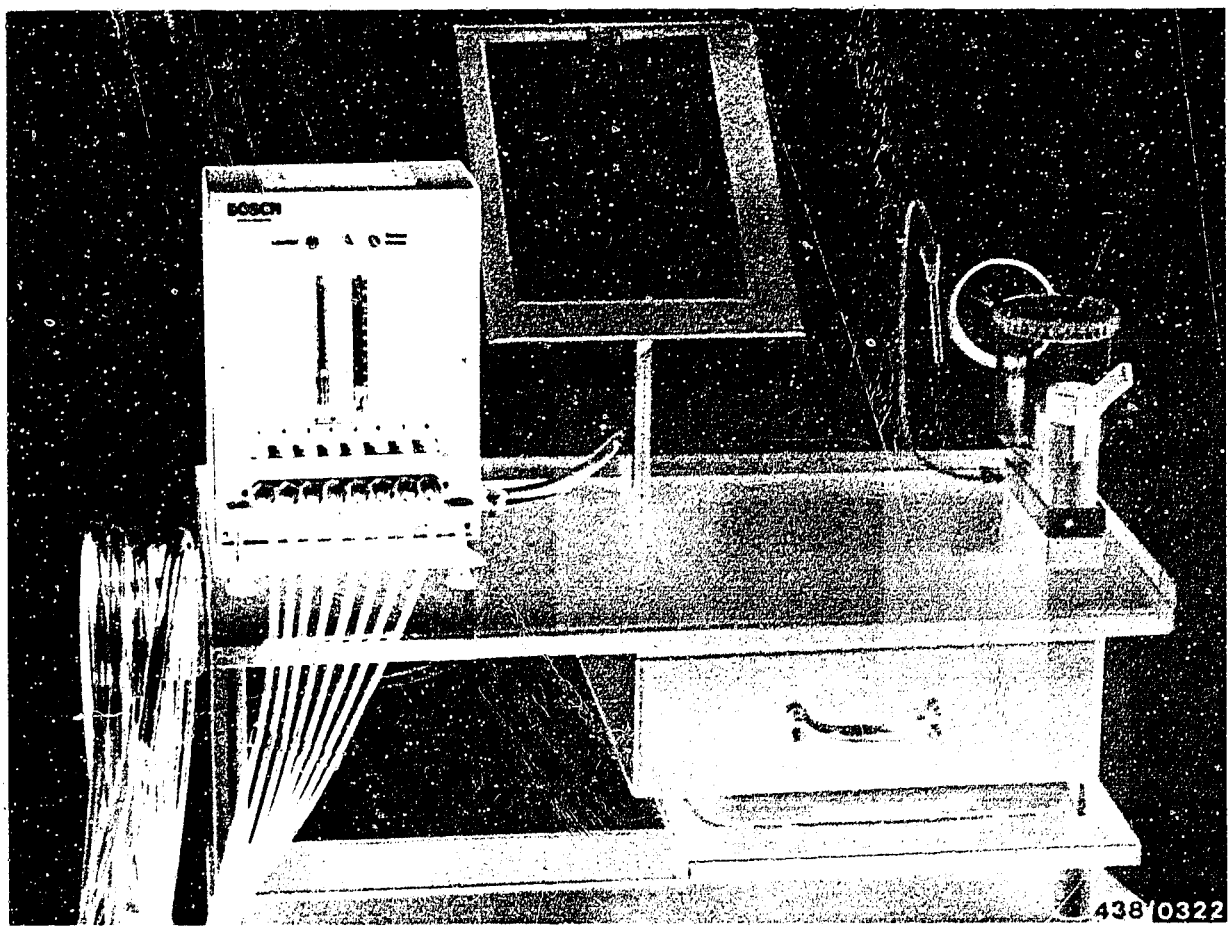
438/0062

Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F 8.

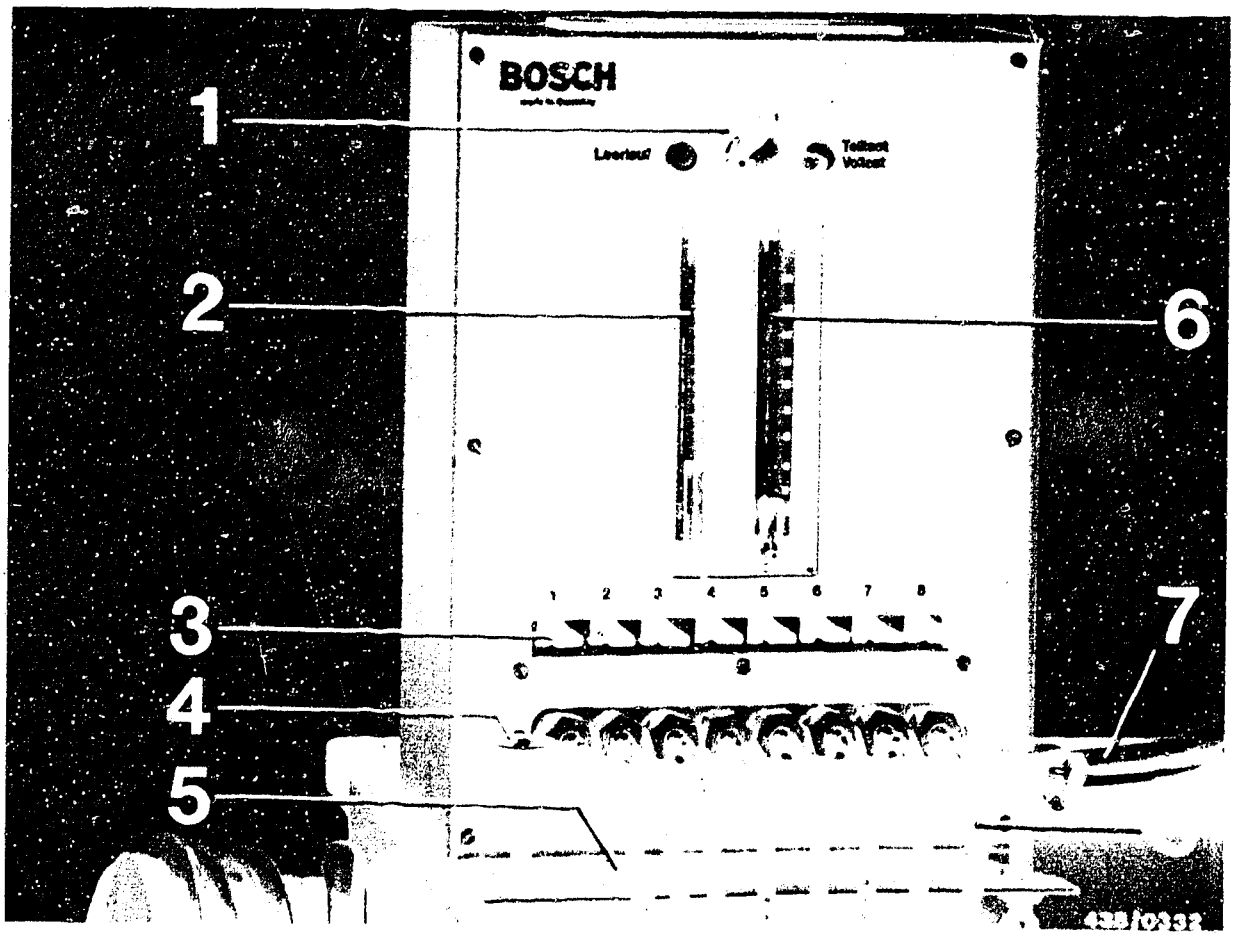


18. Comparative measurement of fuel delivery of fuel distributor outlets.

This test is carried out using the tester for delivered quantity comparison KDJE-P200 (previously KDJE 7451).

18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.
The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load.

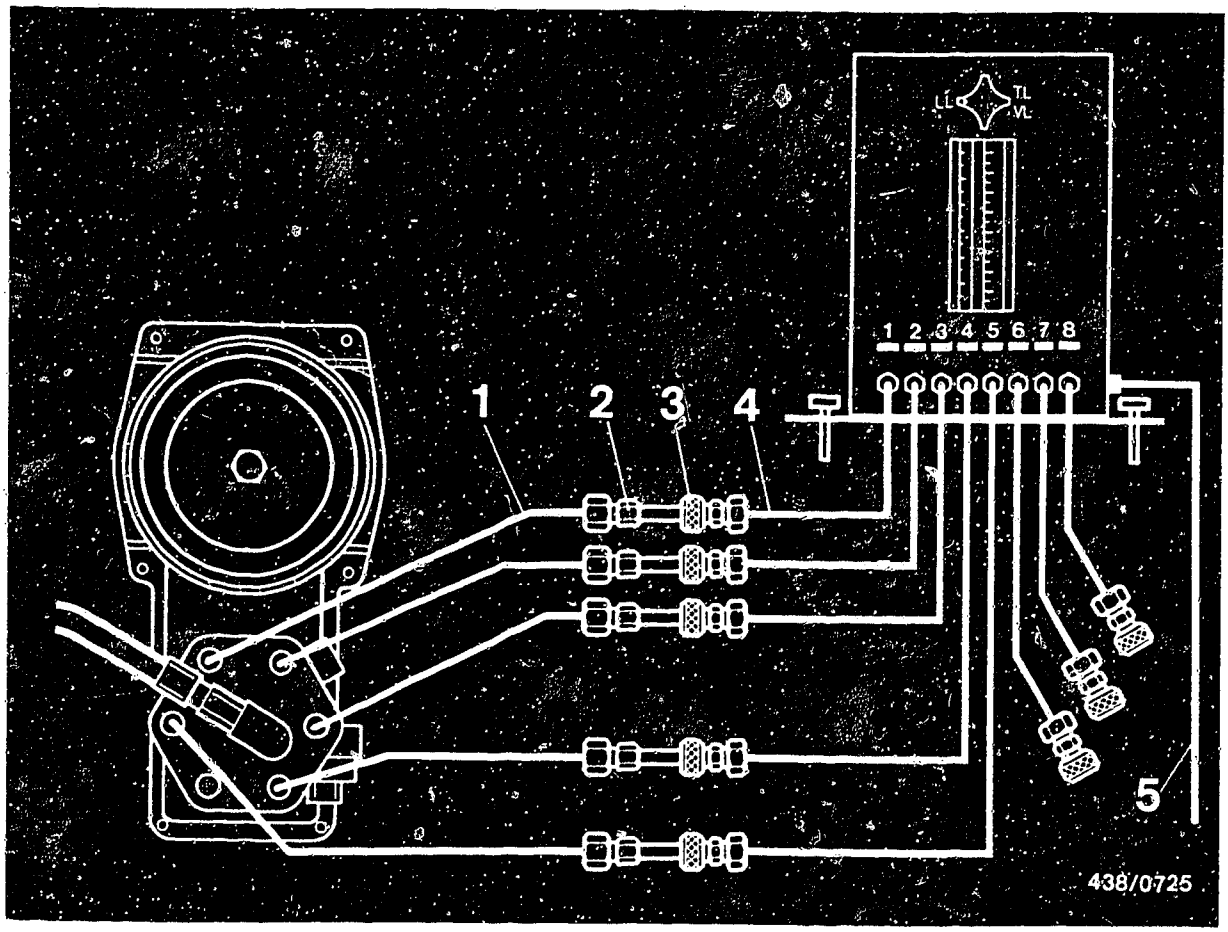
The particular rotameter tube to be used is connected by means of the 3-way stopcock.

Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.



1 = Fuel distributor injection tubing
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

18.3 Setting up and connecting the tester:

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.

Remove injection valves; the injection tubing remains connected.
Clean the injection valves with a rag and insert injection valves in correct sequence into the automatic connectors of the first four tester hoses.

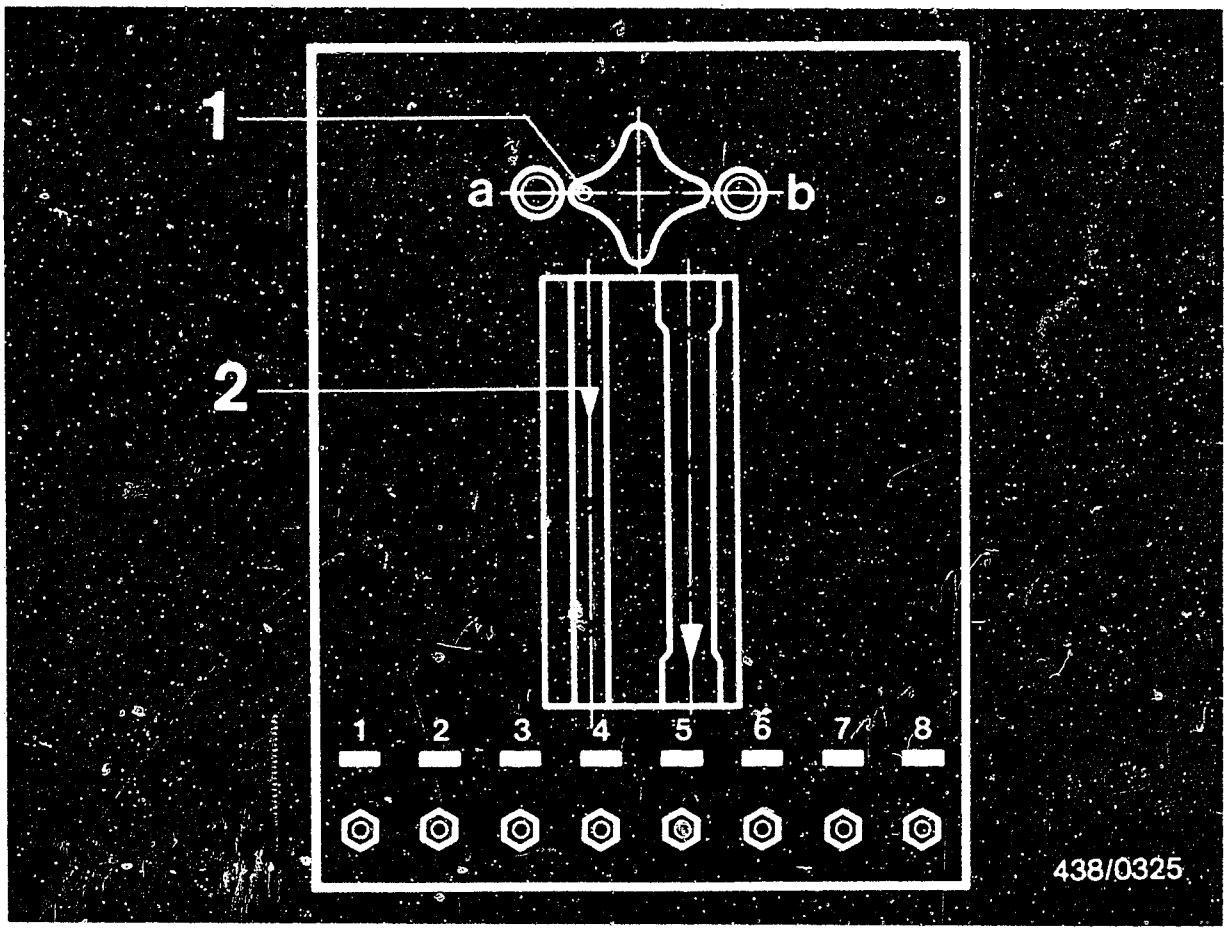
Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are open fully.
Introduce the return hose of the tester into the fuel tank filler neck.

18.4 Bleeding the tester:

Remove the air filter so that air-flow sensor plate becomes accessible.

Remove electrical plug from warm-up regulator.

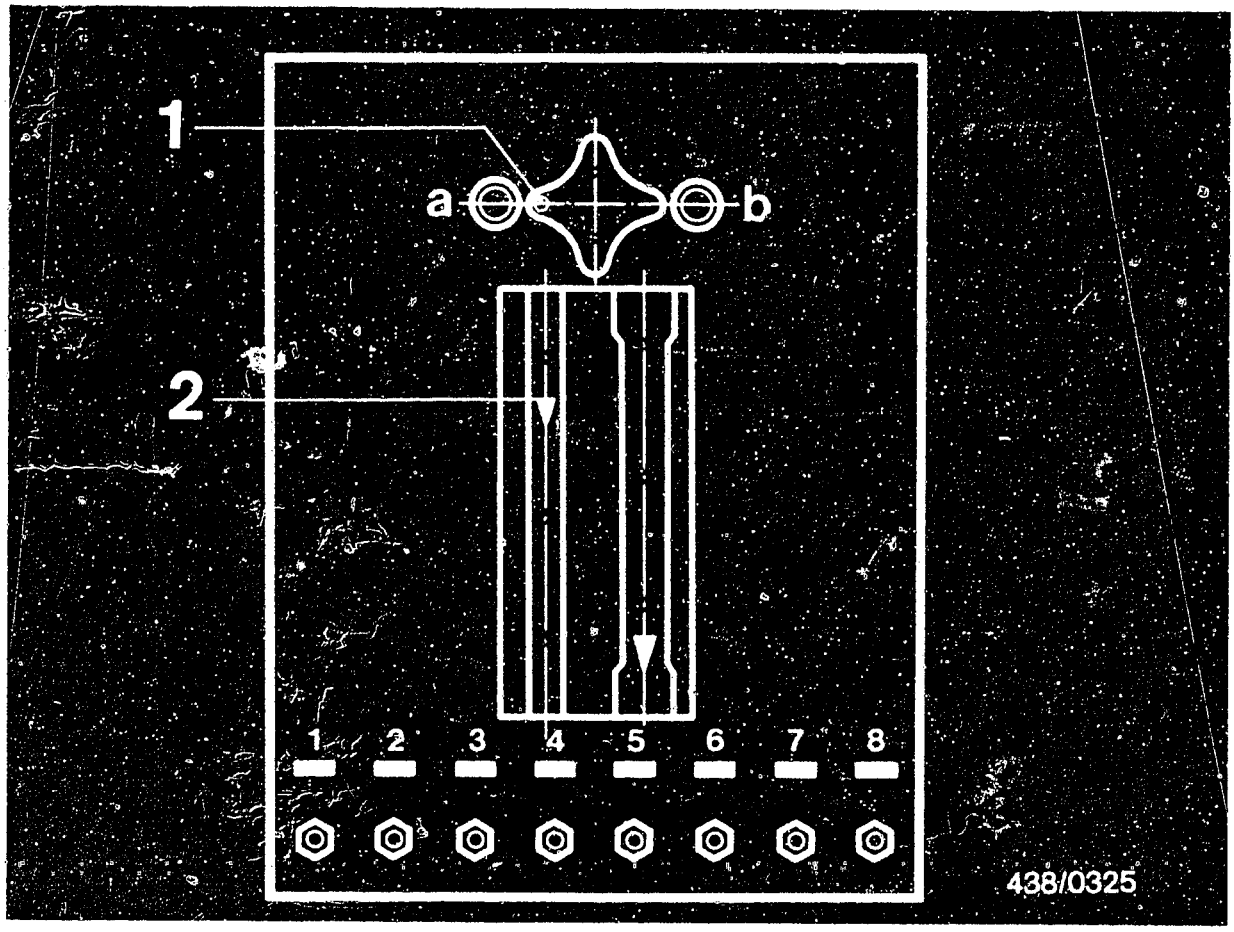
Switch on the electric fuel pump by bridging the electrical safety circuit.
Raise the air-flow sensor plate to the stop.
Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.
Return the sensor plate to the rest position.



1 = White dot
2 = Measuring line
a = Idle
b = Part load/full load

18.5 Testing:

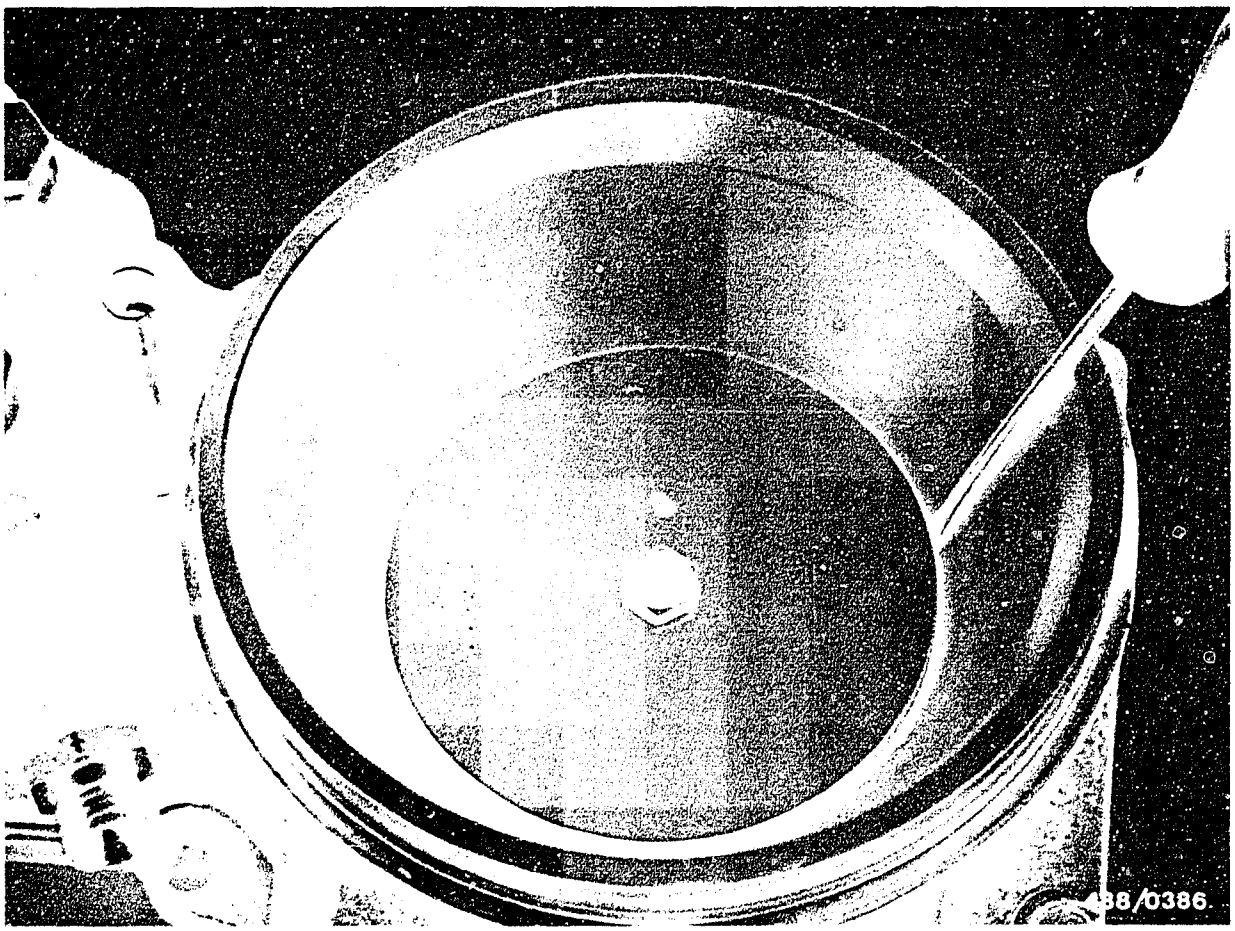
The flow comparison measurement is made in the idle, part-load and full-load ranges.
The small rotameter tube is to be used for the idle measurement (white dot to the left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to the right).



1 = White dot
2 = Measuring line

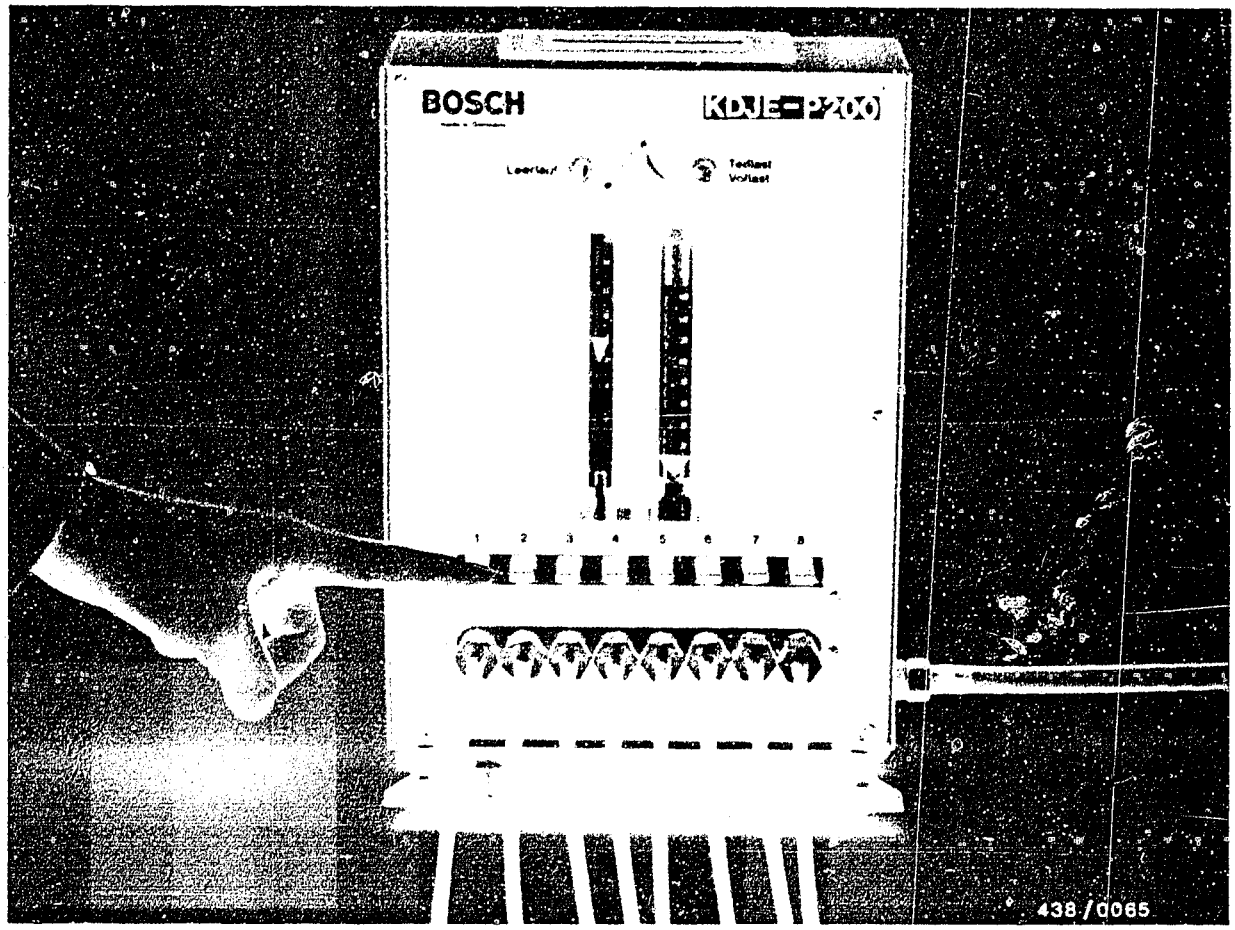
a = Idle
b = Part load/full load

The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2).
On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20...30 seconds in the case of small deliveries.



The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using a screwdriver (a small one for the idle-position), which is inserted to an appropriate depth between the air funnel and air-flow sensor plate.

Procedure:
Switch on the electric fuel pump by bridging the electrical safety circuit.
Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.
The "setpoint" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set-point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set-point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set-point".

18.6 Test specifications

Fuel distributor part number: 0 438 100 135

	Setting point	Max. allowable delivery
Idle	6.0 cm^3/min.	6.7 cm^3/min.
Part load	40.0 cm^3/min.	43.0 cm^3/min.
Full load	165.0 cm^3/min.	180.0 cm^3/min.
This full-load delivery must be reached at least with maximum deflection of air-flow sensor plate.		

If, in testing, too large a difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.
If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this, interchange the injection valves with the greatest and smallest difference.
If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.
Change defective fuel distributor and/or replace defective injection valves.

18.7 Final operations

Check seal rings on stem of injection valves for damage and deformation; if necessary, use new seal rings, part no. 3 430 210 600.

Also check the insulating sleeves. If necessary, tighten with hexagon-socket-screw key (AF 11 mm).

Re-install the injection valves. Make sure this is done correctly. Also install the rubber dome. Make sure that all lines are laid correctly.
Re-connect the electrical safety circuit of the K-Jetronic (re-insert relay). Make sure this is done correctly. By means of a trial run check whether all line connections are leak-tight.

Finally, check the idle adjustment. Correct if necessary (Coordinates F 8).

19. Idle adjustment

19.1 Test conditions, general for all models:

- Warm the engine up for the idle adjustment (oil temperature approx. 80°C).

Important Note:

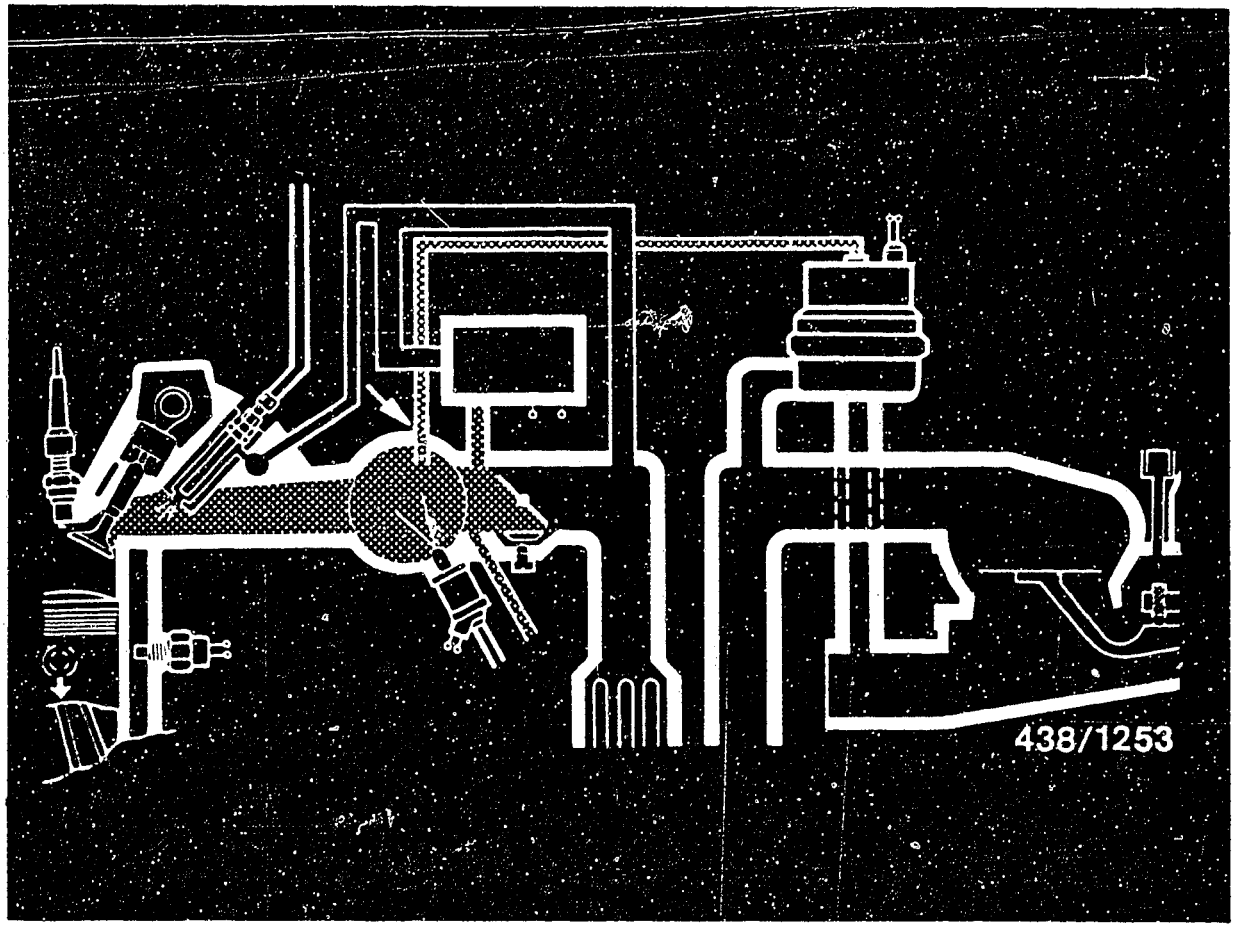
- If the fuel-injection tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.
- The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.
- In vehicles with an air conditioner, this should be switched off to stabilize the engine speed during idle-speed adjustment.
- Engine-speed measurement with separate tachometer.

Further requirements prior to the idle and CO adjustment:

- Check whether the throttle lever is up against the idle stop. The linkage must be adjusted free of tension.

- The engines are equipped as standard with overrun cut-off. This system must be rendered inoperative prior to the idle CO adjustment.

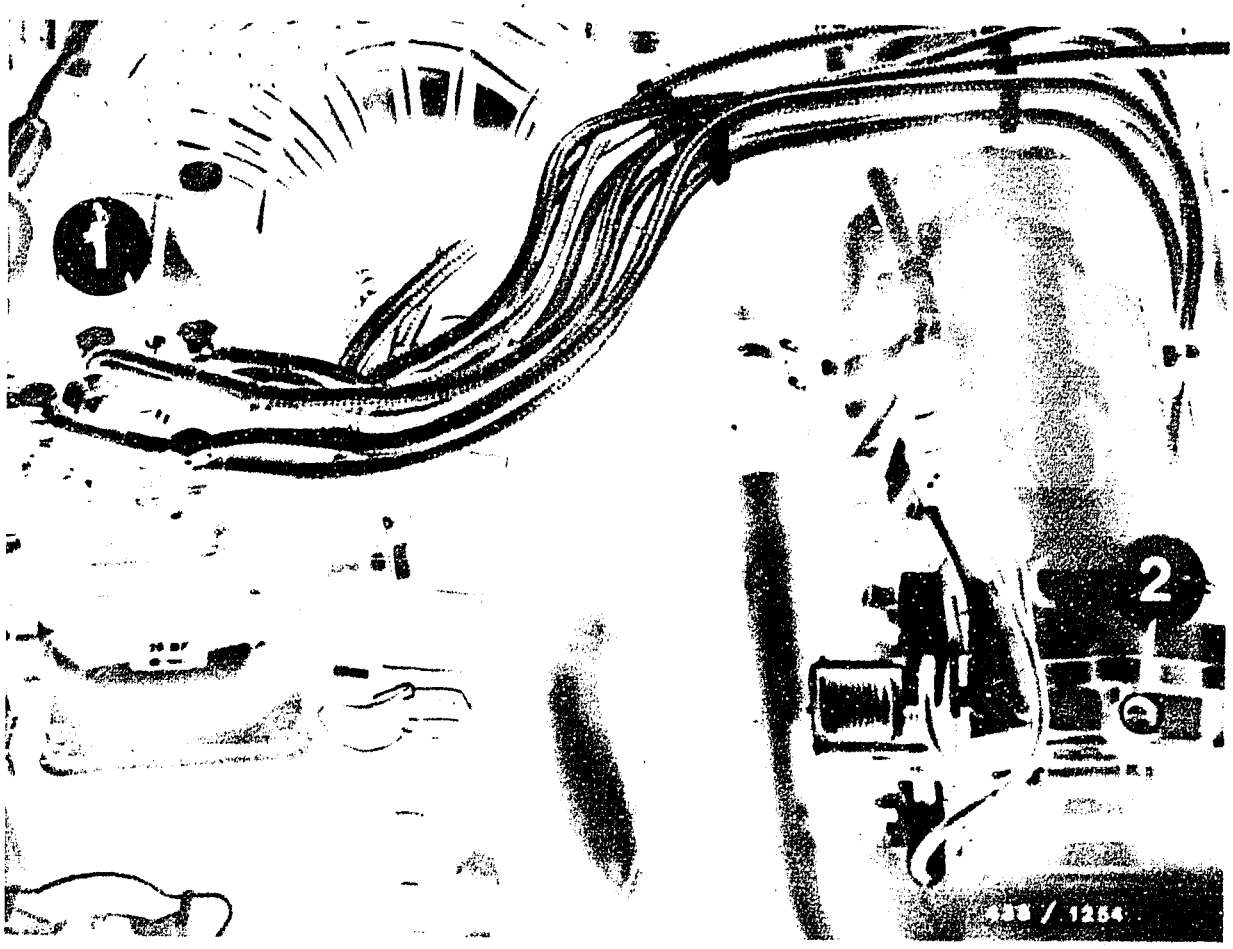
  The following coordinate describes how to render this system inoperative.



19.2 Rendering the overrun cutoff inoperative

Disconnect hose from manifold-pressure connection fitting (arrow).

Tightly seal off end of hose and manifold-pressure connection fitting.

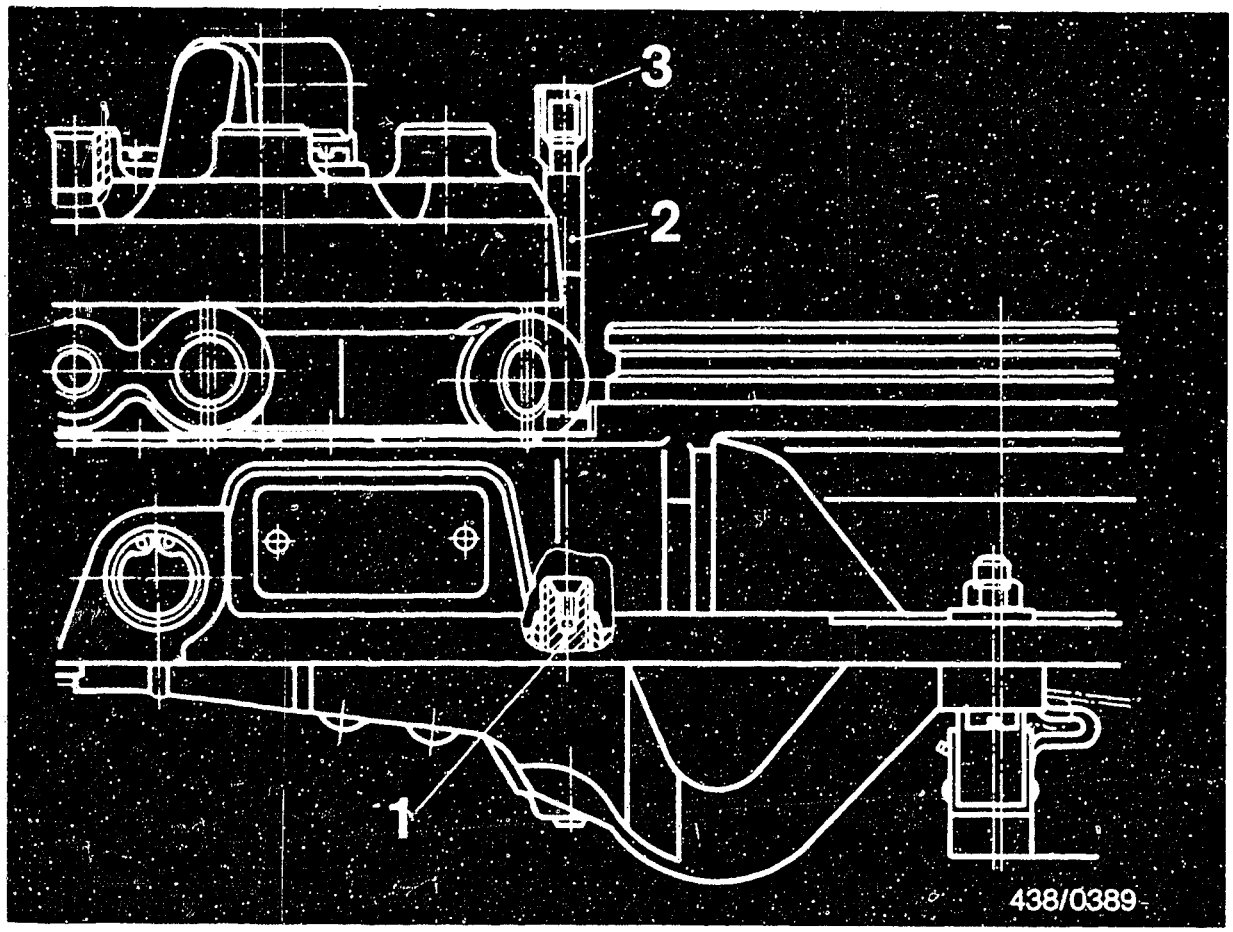


1 = To idle-mixture-adjusting screw
2 = Idle-speed bypass screw

9.3 Idle and CO correction

Adjust the idle controller current indirectly via the bypass screw on the throttle-valve assembly.

Adjust the CO concentration in the exhaust gas at the idle-mixture-adjusting screw in the mixture-control unit.



1 = Idle-mixture-adjusting screw
2 = Guide tube
3 = Anti-tamper cap

Adjusting the CO concentration

The CO concentration is adjusted by turning the idle-mixture-adjusting screw in the mixture-control unit using the adjusting wrench KDEP 1035.

After removing the safety cap of the guide tube, the adjusting wrench is passed through the guide tube and inserted into the idle-mixture-adjusting screw.

Turning to the right = richer mixture
Turning to the left = leaner mixture

Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.

19.4 Anti-tamper device for idle-mixture-adjusting screw:

In the Federal Republic of Germany, § 47 of the FMVSS/ CUR, "Exhaust Gases and their Discharge", has been amended. This amendment order was printed in full in the Verkehrsblatt 13 of 15th July 1975.
Accordingly, all motor vehicles with externally supplied ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissably influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.
These anti-tamper caps come in different colors. The cap to be used for the after-sales service of updraft air-flow sensors is red.
It can be obtained from Bosch under part number 3 430 522 002.
The bore of the setting device (for receiving the adjusting wrench) is sealed by a plug.
e.g. No. 4521/7 from Hazet, 5630 Remscheid.

19.5 Idle test specifications

Test conditions

Engine at normal operating temperature, oil temperature approx. +80°C. Switch on upper beam, switch off air conditioner. Render overrun cutoff inoperative. Disconnect crankcase breather hose from cylinder head cover and seal off end of hose. Radiator fan must not operate when adjusting.

The otherwise customary idle speed adjustment is dispensed with since these vehicles are equipped with an electronic idle speed stabilization system (not made by Bosch).

Before adjusting, cut lead between term. 1 and control unit term. 17 by undoing the connector. The connector is mounted in a holder behind the cover under the instrument panel.

- Idle actuator current with connector disconnected:

Air conditioner off	410 ... 450 mA
Air conditioner on:	
Manually-shifted transmission	470 ... 510 mA
Automatic	480 ... 520 mA

- The bypass screw on the throttle-valve assembly is adjusted so that, with the engine warm, there result the following idle speeds:

Air conditioner off:	750 ... 850 min^{-1}
Aid conditioner on:	850 ... 950 min^{-1}

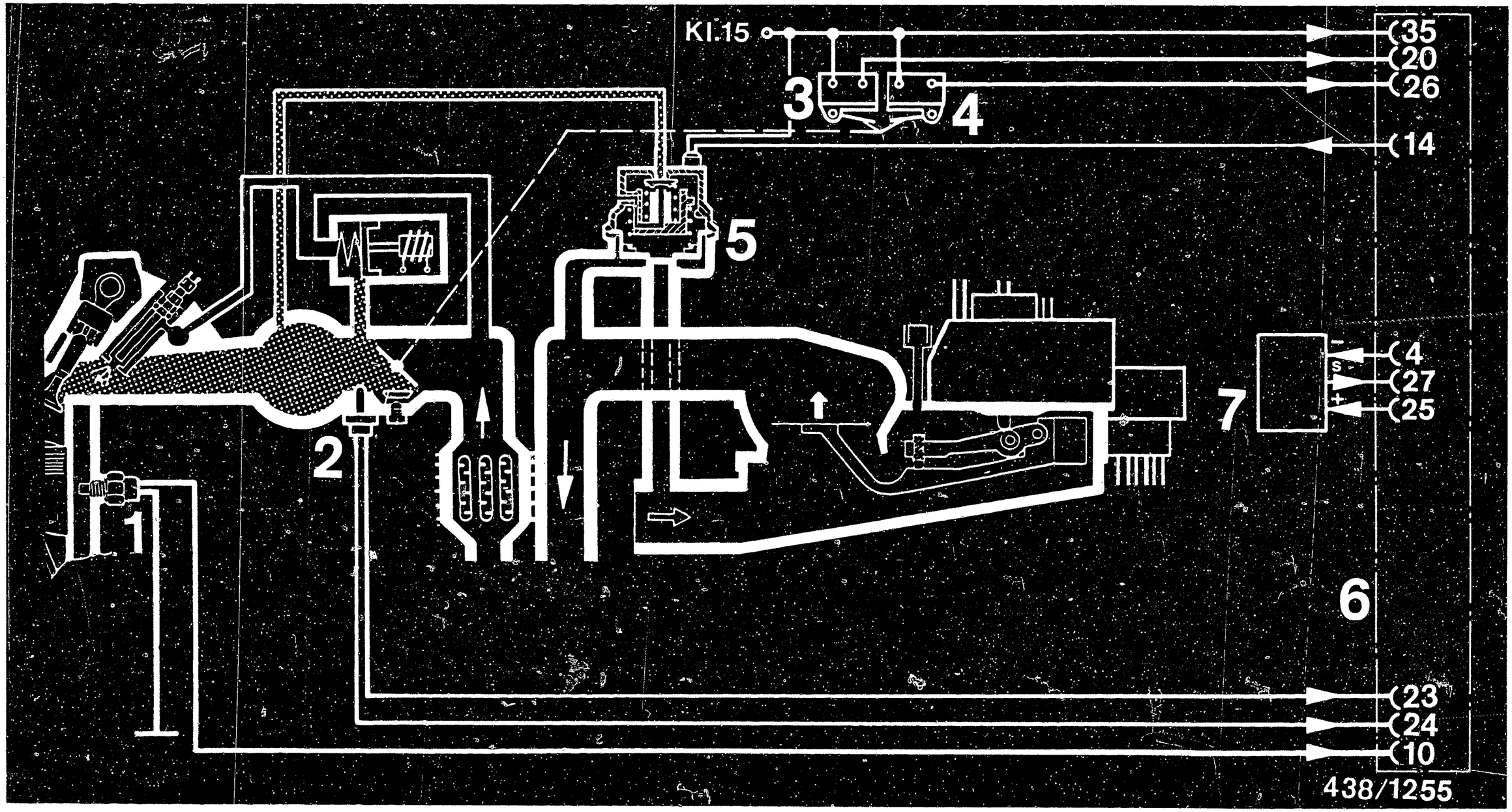
If idle speed differs, test idle speed stabilization. The idle speed stabilization system is described on Coordinate G 12.

- CO concentration 0.8 ... 1.2 % by vol.

19.6 Final operations

Re-connect the crankcase ventilation hose to the cylinder head cover.

Connect manifold-pressure hose of overrun cutoff to connection fitting.



1 = Engine temperature sensor
2 = Air temperature sensor
3 = Idle throttle-valve switch
4 = Full-load throttle-valve switch
5 = Overrun cutoff valve
6 = Control unit for ignition, injection and overrun cutoff
7 = Hall generator

20. Overrun cutoff
Only on vehicles with manually-shifted transmission

20.1 Operating principle

The control unit combines the functions of "ignition", "injection" and "overrun cutoff".

At terminal 27 the control unit receives engine-speed pulses from terminal S of the Hall generator.
The engine temperature sensor, acting on terminal 10, suppresses the overrun cutoff at coolant temperatures below +30°C.

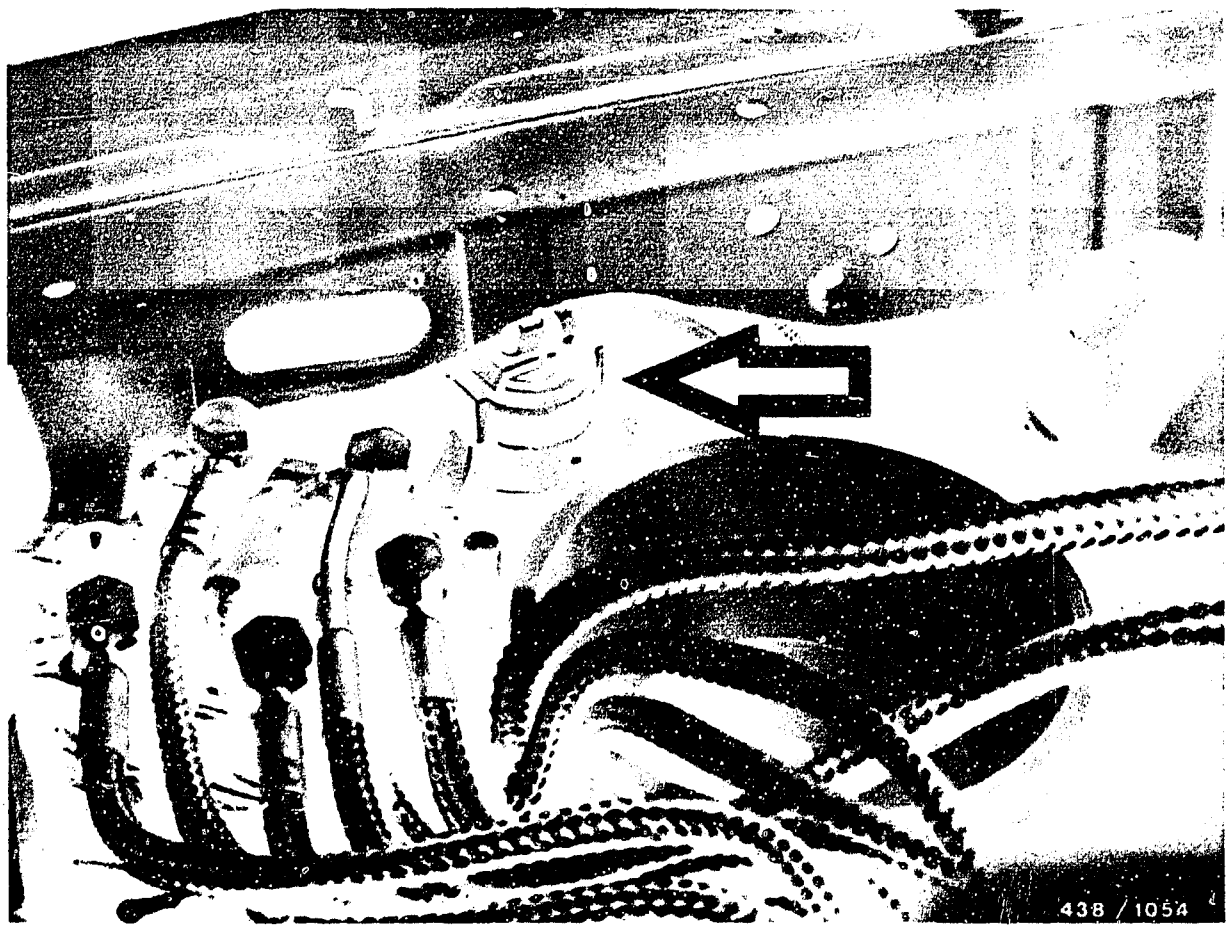
With the idle throttle-valve switch closed, at an engine speed greater than 1200 min^{-1} and a coolant temperature higher than +50°C, ground is applied to the overrun cutoff valve through output 14 of the control unit.

If battery voltage (positive from term. 15) and ground (negative) are applied, the control valve in the overrun cutoff valve opens electromagnetically.

The manifold vacuum acts on the spring-loaded diaphragm and opens the air bypass duct.

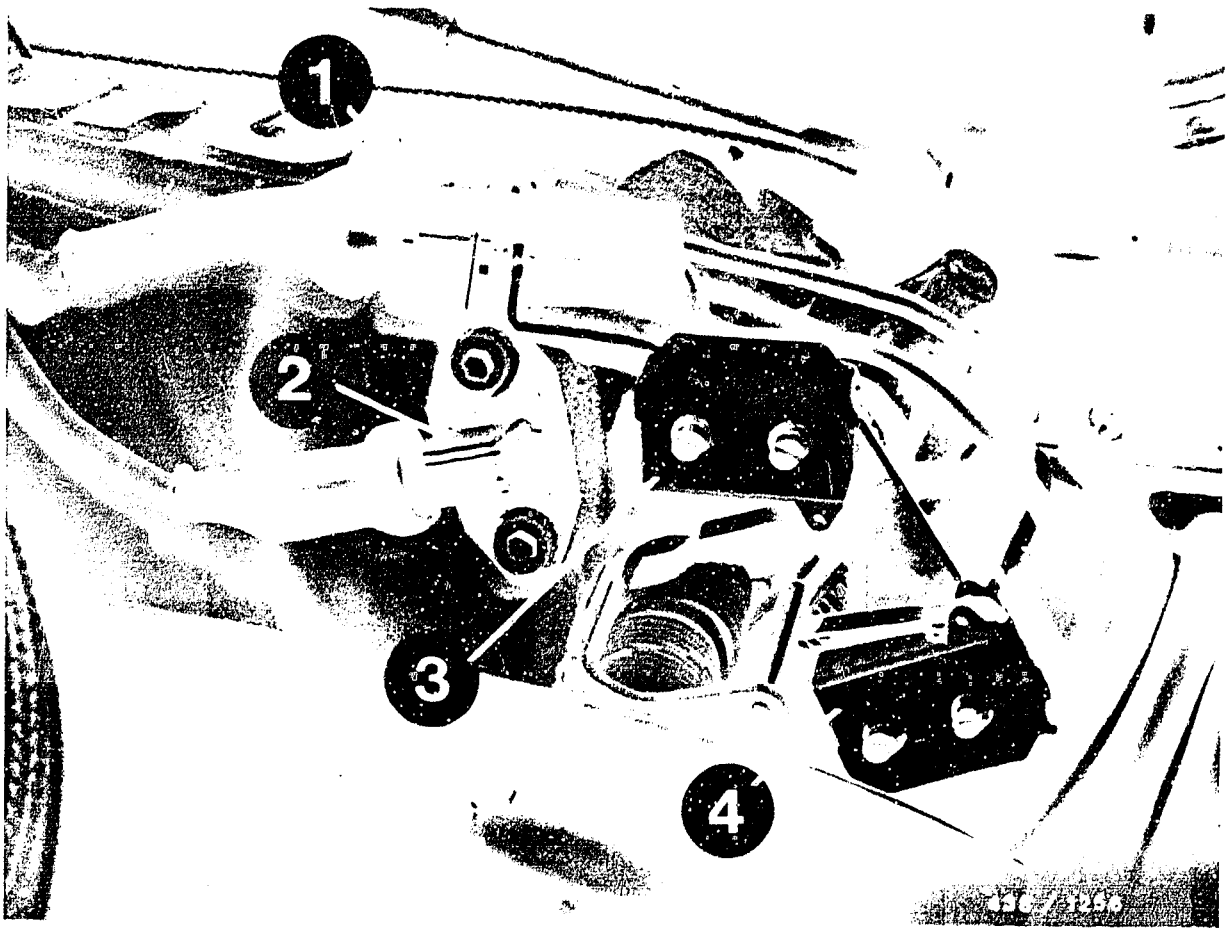
With the overrun cutoff valve open, the air which is inducted by the engine bypasses the air-flow sensor. The air-flow sensor plate remains in the rest position, and no fuel is metered or injected.

If one of these conditions changes, the overrun cutoff valve closes and normal fuel metering is resumed.



Arrow = Overrun cutoff valve (behind right-hand wall)

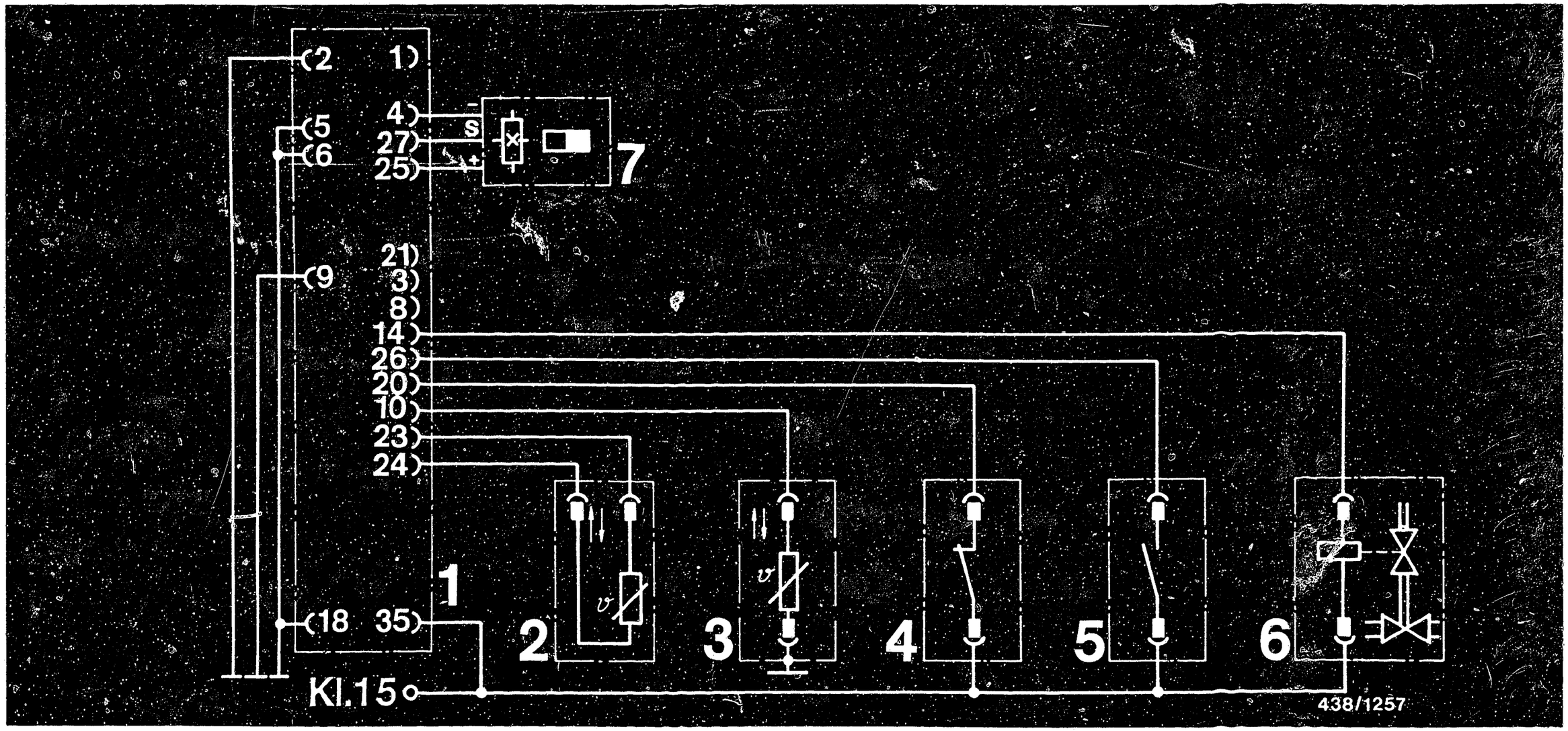
20.2 Installation position of components



1 = Plug connector for throttle-valve switch
2 = Air temperature sensor
3 = Full-load throttle-valve switch
4 = Idle throttle-valve switch

The control unit for ignition, injection and overrun cutoff is mounted in the front passenger footwell, on the right behind a cover on the right-hand side wall.

The engine temperature sensor is situated under the spark-plug connector of cylinder 1 (not shown).



1 = Control unit for ignition, injection and overrun cutoff
2 = Air temperature sensor
3 = Engine temperature sensor
4 = Idle throttle-valve switch
5 = Full-load throttle-valve switch
6 = Overrun cutoff valve
7 = Hall generator

20.3 Electrical circuit diagram

The functions of the temperature sensors and of the throttle-valve switches are used for ignition, injection and overrun cutoff.

20.4 Rapid diagnosis chart for overrun cutoff

Customer complaint (symtom of trouble)

1. Strong jerk when accelerating out of overrun

2. When declutching during the overrun phase the engine stops or drops below idling speed

3. Overrun cutoff also operates when engine is cold (temperatures ≤ + 30° C)

1	2	3	Cause of trouble	Remedy	Coordinates
●			Idle throttle-valve switch incorrectly adjusted	Adjust microswitch so that it is closed with the throttle valve in the idle position and so that it opens at approx. 1...2.5° throttle angle.	G 20
●			Throttle-valve bearing worn	Check throttle-valve stop and bearing for play. If necessary adjust the stop or replace the bearing.	---
	●		Overrung cutoff valve not closing, leaking	Replace the overrun cutoff valve	---
	●		Control unit defective	Cut-in and cut-out engine-speed thesholds of control unit incorrect. Control unit defective or incorrect - replace.	---
		●	Engine temperature sensor defective.	Renew temperature sensor.	---

20.5 Electrical tests

Test all leads for continuity and correct connection.

• Control unit

Testing of terminals in 35-pin plug.
Plug disconnected from control unit.

Inputs:

Terminal 35	= Battery voltage (positive) from terminal 15 (ignition)
Terminal 27	= Engine-speed pulses from terminal S of Hall generator
Terminals 2,5,6,9 and 18	= Vehicle ground
Terminal 10	= Ground through engine temperature sensor 60 ... 1000 Ω
Terminal 20	= Battery voltage (positive) through idle throttle-valve switch

Output:

Terminal 14	= Connection to a terminal of the overrun cutoff valve.

- Idle throttle-valve switch

  Testing of terminals at connector. Plug connection on throttle-valve assembly remains plugged together.

  Input: Vehicle electrical system voltage via terminal 15

  Output: Vehicle electrical system voltage connected through to control unit term. 20 when throttle valve in idle position.

- Overrun cutoff valve

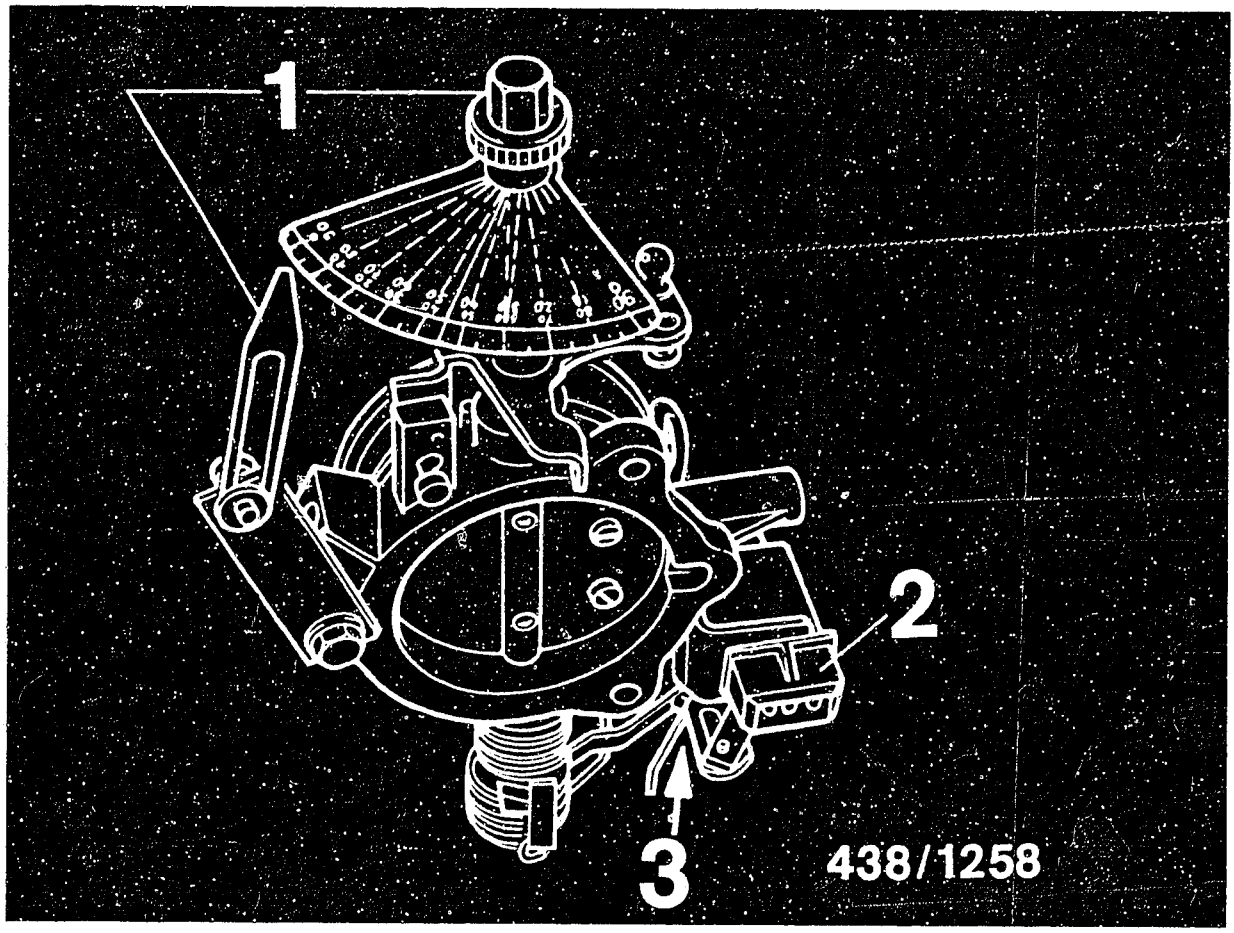
  Testing of terminals in connector. Undo plug connector.

  Inputs: One terminal = connection to terminal 14 of control unit. The other terminal = connection to terminal 15 of ignition.

  Resistance test at connector: Test specification approx. 40 ... 90 Ω

- Engine temperature sensor

  Resistance above 20°C: Test specification approx. 60 ... 1000 Ω



1 = Angle measuring device KDJE-7462
2 = Plug connector for throttle-valve microswitch
3 = Microswitch (concealed under throttle valve)

20.6 Adjusting the microswitch

The adjustment is checked with angle measuring device KDJE-7462 and multimeter.

With throttle valve in idle position, the contact must be closed; at 1 ... 2.5° throttle angle it must be open.

To adjust/renew the microswitch, remove throttle-valve assembly.

20.7 Testing the overrun cutoff for proper operation

- Remove plug from overrun cutoff valve.
- Let the engine idle.
- Apply battery voltage to valve.

↓

Valve opens, engine stops

No →
- Let the engine idle.
- Using hand vacuum pump, apply vacuum to overrun cutoff valve - approx 500 mbar
- Apply battery voltage to valve.

↓

Valve opens, engine stops.

No → Valve defective, replace.

↓

Yes

↓

Valve O.K.
Manifold pressure triggering defective

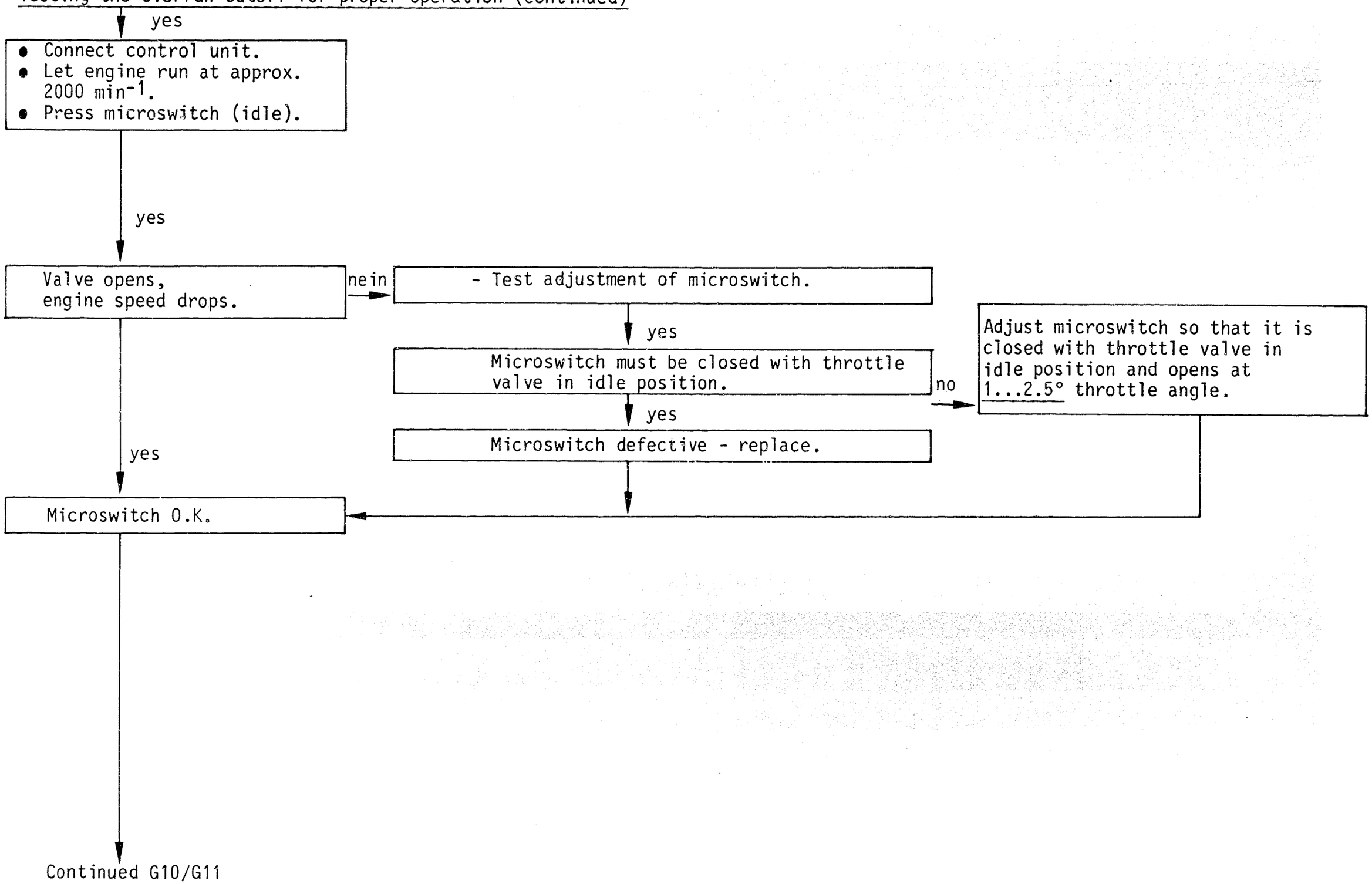
↓

Yes → Overrun cutoff valve O.K.

↓

Continued C8/C9

Testing the overrun cutoff for proper operation (continued)



Testing the operation of the overrun cutoff (continued)

- Control unit remains connected.
- Bring warmed-up engine to approx. 3000 min^{-1}
- Press microswitch.

yes

Valve opens, engine speed drops.

yes

Test engine temperature sensor.

yes

Above +20°C resistance of temperature sensor 60 ... 1000 Ω.

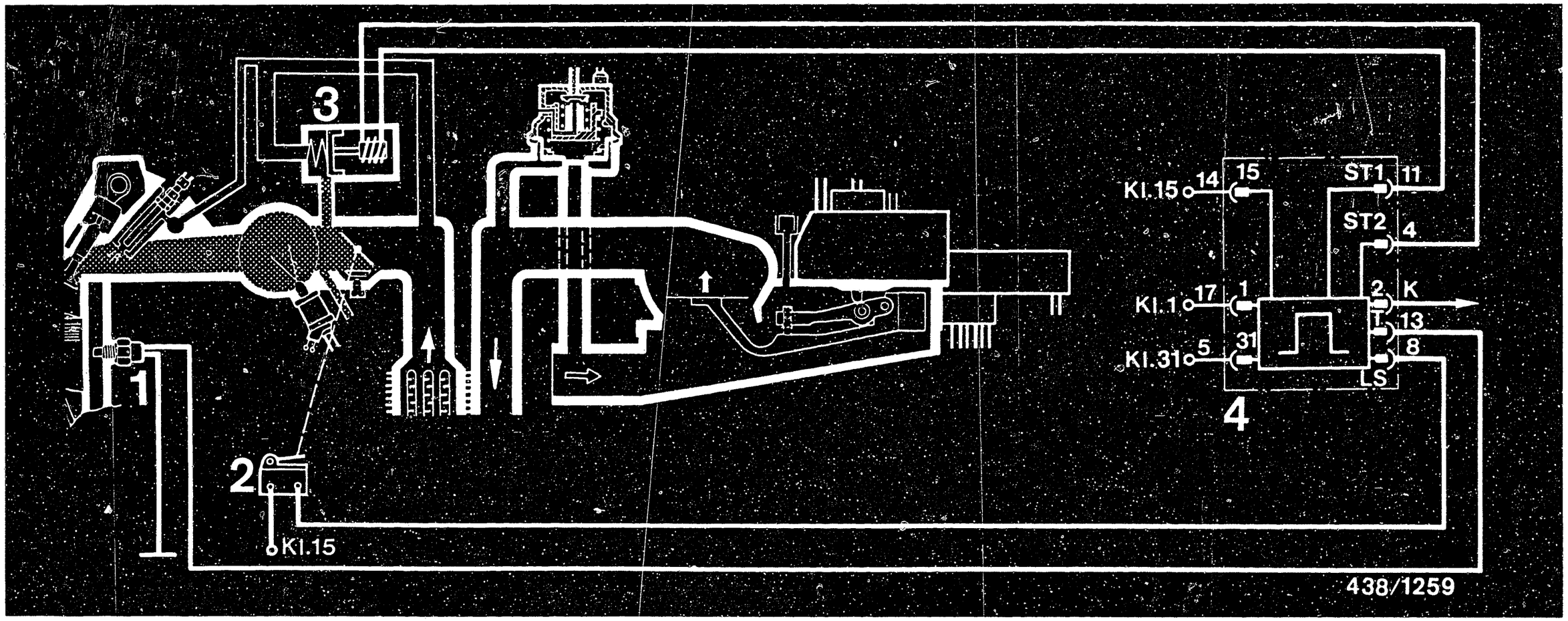
no

Temperature sensor defective, renew.

yes

Control unit defective, renew.

Control unit and temperature sensor operating. Overrun cutoff O.K.

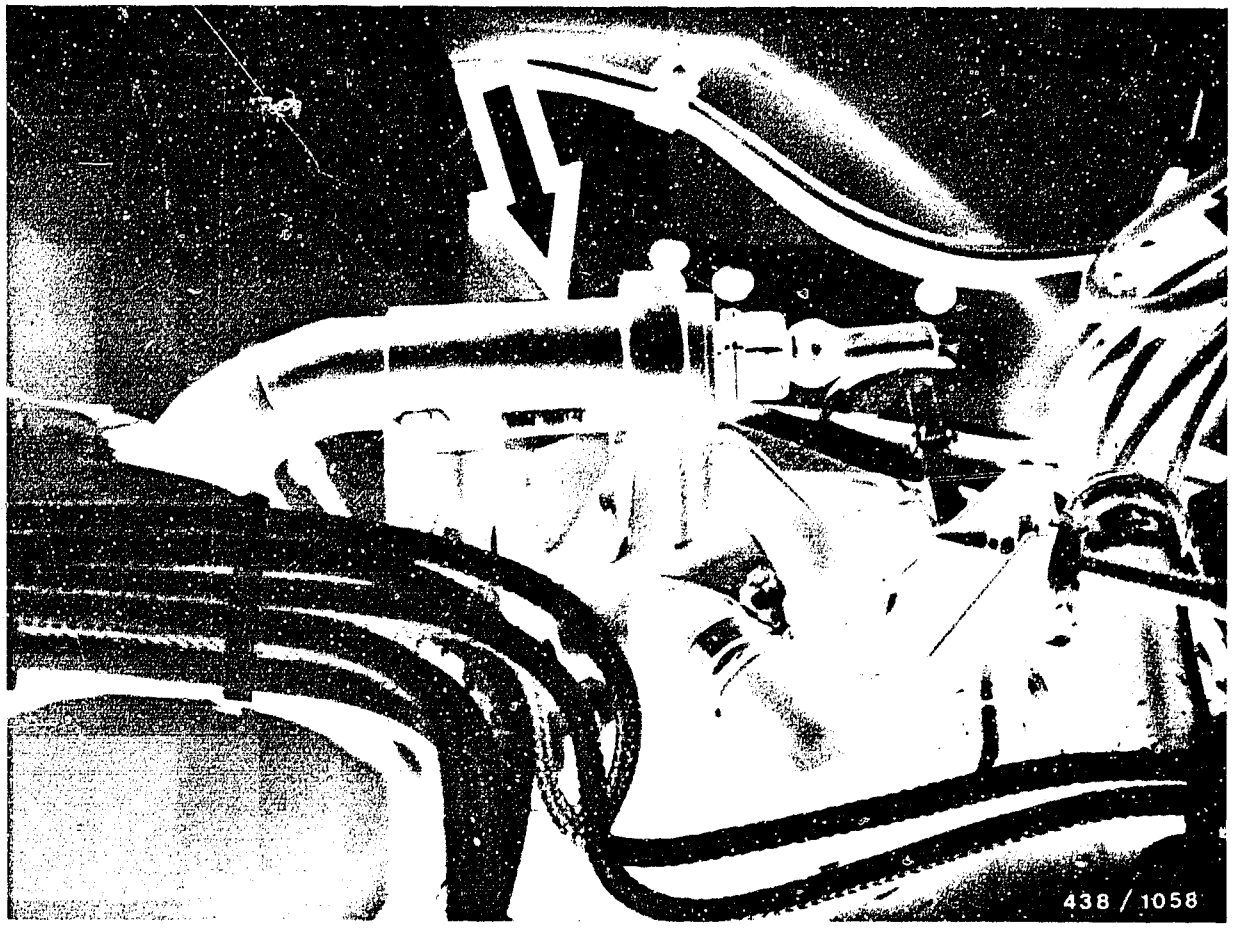


1 = Thermo-switch
2 = Idle throttle-valve switch
3 = Idle controller
4 = Control unit for idle-speed stabilization
K = To air-conditioner compressor

21. Idle-speed stabilization (not made by Bosch)

21.1 Operation

The idle speed is stabilized by the electronic control unit and the idle controller. The idle controller is situated in the air bypass around the throttle valve instead of the otherwise customary auxiliary-air device.
From the control unit the tractive electromagnet of the idle controller receives a variable voltage of constant frequency. This moves the blocking plate in the air duct, thus changing the air throughput.



Arrow = Idle controller

From the ignition pulses (terminal 1) the ACTUAL engine speed is derived, compared in the control unit with a SETPOINT engine speed and the idle controller is actuated accordingly.

The control unit (double relay size) is on the relay board under the instrument panel and occupies positions 11 and 12.

21.2 Components and functions

- Control unit

  Processes the input information and actuates the idle controller.

- Idle controller

  Changes the air throughput

- Thermo-switch + 30° C

  In coolant system for increased idle speed during warm-up period.
  (under spark-plug connector of cylinder 1)

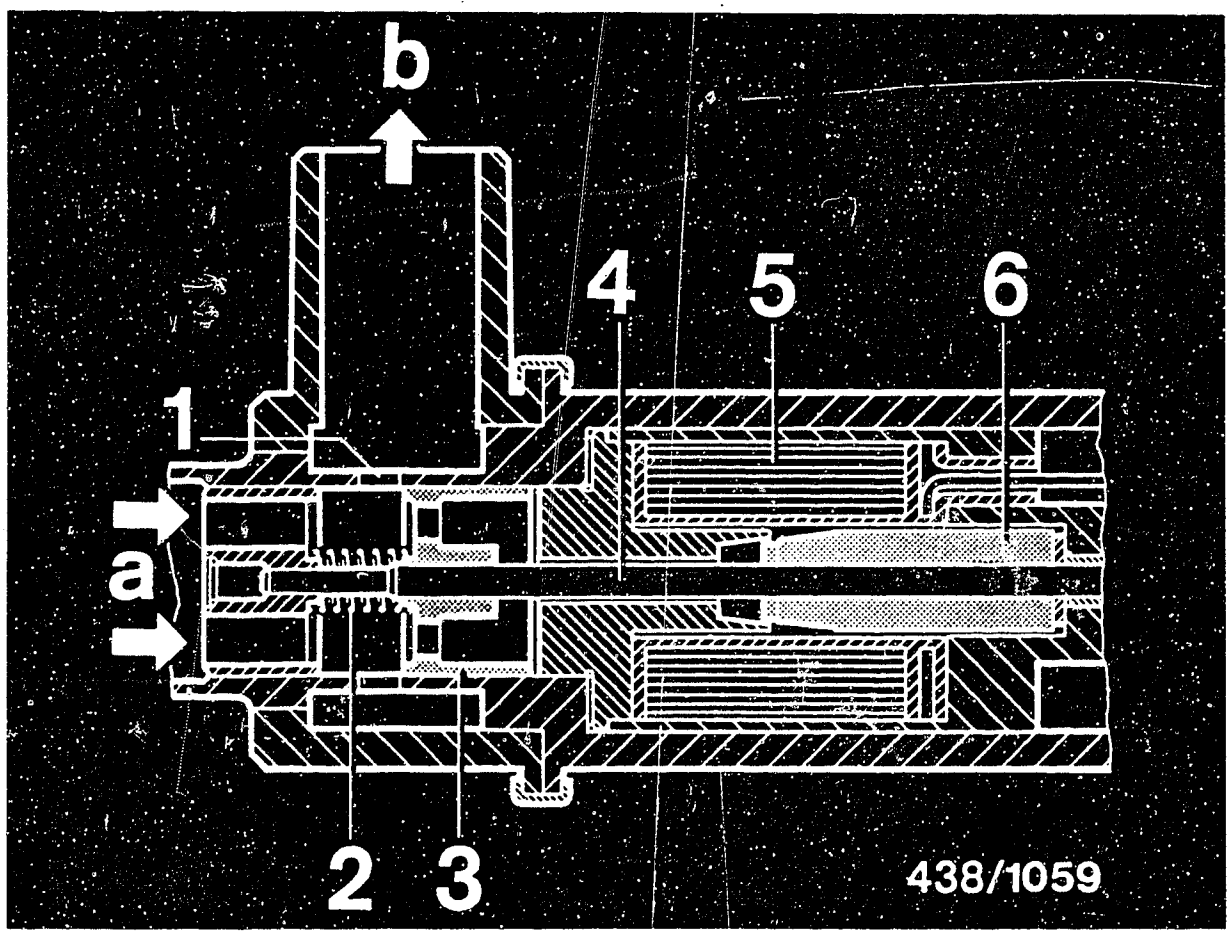
  Idle throttle-valve switch

  For detection of idle.

Further inputs to control unit:

Terminal 1 = Engine speed from terminal 1 of ignition coil

Terminal A = Connection from air conditioner compressor.



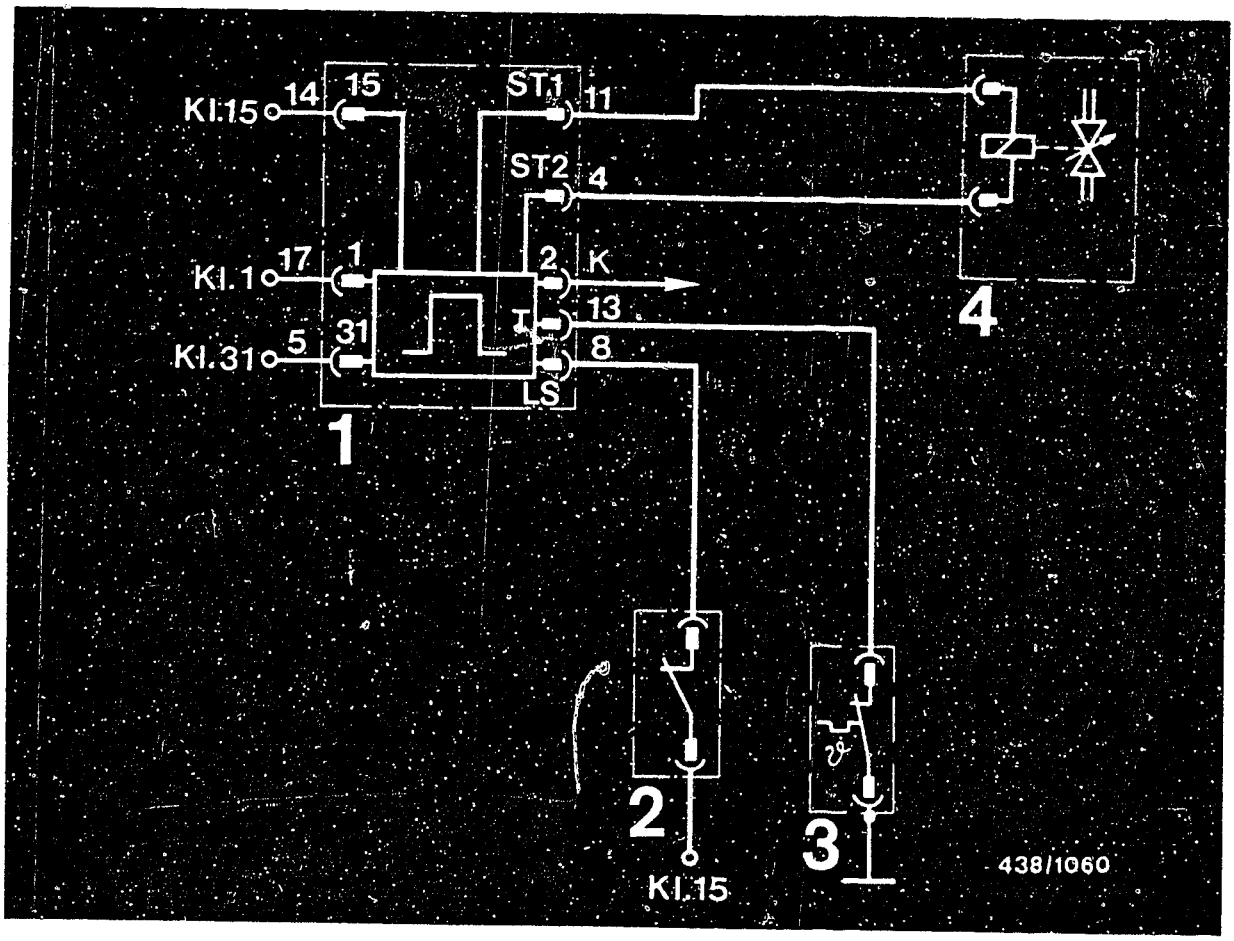
1 = Blocking plate	5 = Solenoid
2 = Compression spring	6 = Magnetic core
3 = Piston	a = Air inlet
4 = Shaft	b = Air outlet

Idle controller

- Engine cold - blocking plate is wide open
  Switch on ignition.
  Controller current should be 540...600 mA

- Engine warm - blocking plate is less open
  Controller current should be:
  Vehicle without air conditioner (or with air conditioner switched off): 410...450 mA

  With air conditioner on:
  Manually-shifted transmission 470 ... 510 mA
  Automatic 480 ... 520 mA



1 = Control unit
2 = Idle throttle-valve switch
3 = Thermo-switch
4 = Idle controller
K = To air conditioner compressor

21.3 Electrical circuit diagram

The function of the idle throttle-valve switch is used both for idle speed stabilization as well as for overrun cutoff.

21.4 Notes on testing

Test all leads for continuity and correct connection.

• Control unit

Test terminals in plug-in base.
Remove control unit from plug-in base.

Inputs:

Terminal 14/15	= Vehicle electrical system voltage (positive) from terminal 15
Terminal 17/1	= Engine-speed pulses from terminal 1 (ignition coil)
Terminal 5/31	= Ground (negative)
Terminal K/2	= Connection to air conditioner compressor
Terminal 13/T	= Ground from thermo-switch (only at engine temperatures ≦ + 20° C)
Terminal 8/LS	= Vehicle electrical system voltage from terminal 15. Via microswitch with throttle valve in idle position

Outputs:

Terminal 11/ST1	= To idle controller
Terminal 4/ST2	= To idle controller

• Microswitch

Test terminals at connector. Plug connector behind throttle-valve assembly remains connected together.

Input: Vehicle electrical system voltage via terminal 15
Output: Vehicle electrical system voltage with throttle valve in idle position

• Thermo-switch

Test terminals with connectors disconnected

Below + 20° C: Contact closed (0 Ω)
Above + 40° C: Contact open (∞ Ω).

• Control unit

Remove plug from idle controller. Switch on ignition. Voltage across plug = Approx. vehicle electrical system voltage. If not, replace control unit.

• Idle controller

Engine at normal operating temperature. Plug connected to idle controller. The working vibrations at the idle controller can be felt. If not, replace idle controller.

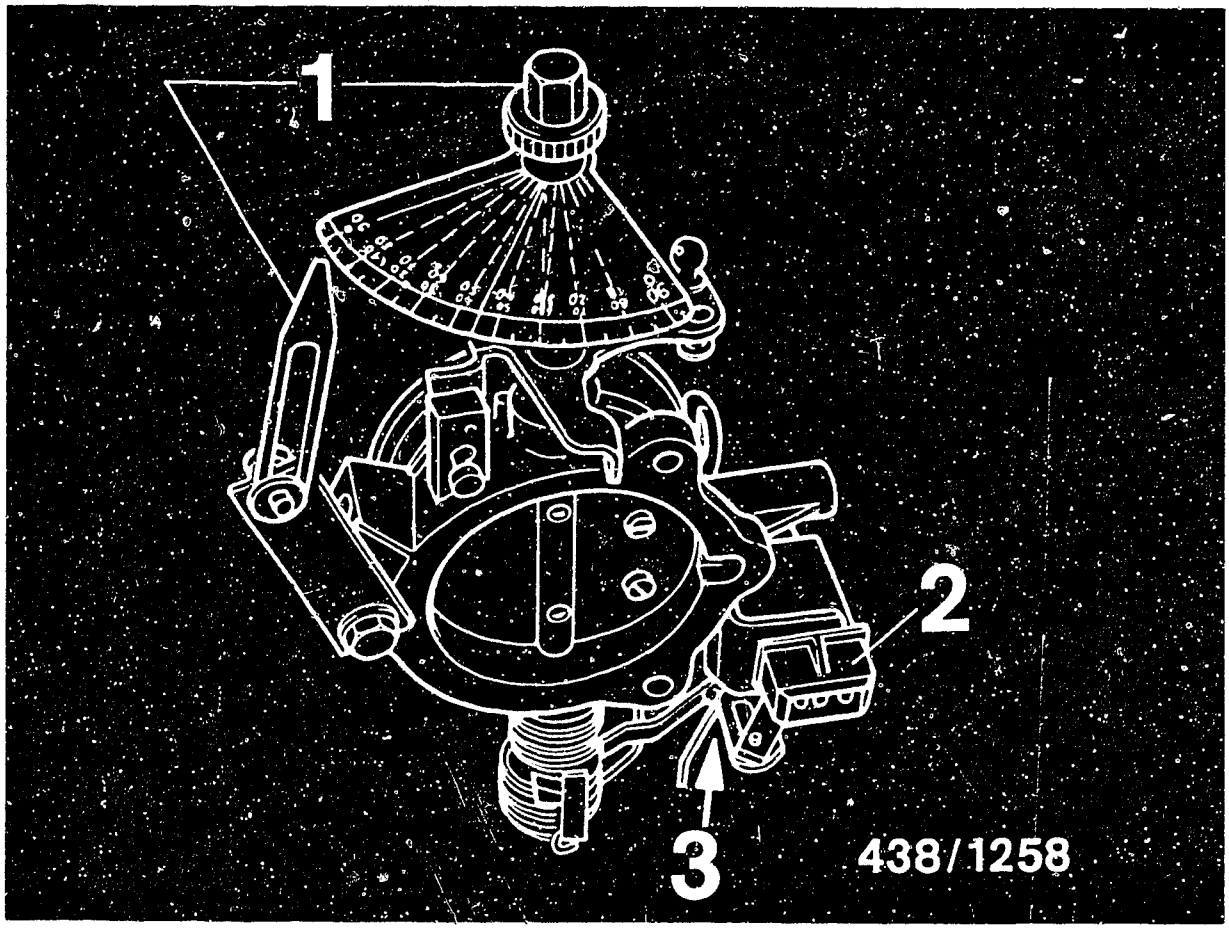
• Test specifications

Idle speed

Air conditioner off	750 ... 850 min^{-1}
Air conditioner on	850 ... 950 min^{-1}

With idle actuator current

Air conditioner off	410 ... 450 mA
Air conditioner on:	
Manually-shifted transmission	470 ... 510 mA
Automatic	480 ... 520 mA



1 = Angle measuring device KDJE-7462
2 = Plug connector for throttle-valve microswitch
3 = Microswitch (concealed under throttle valve)

21.5 Adjusting the microswitch

The adjustment is checked with angle measuring device KDJE-7462 and multimeter.

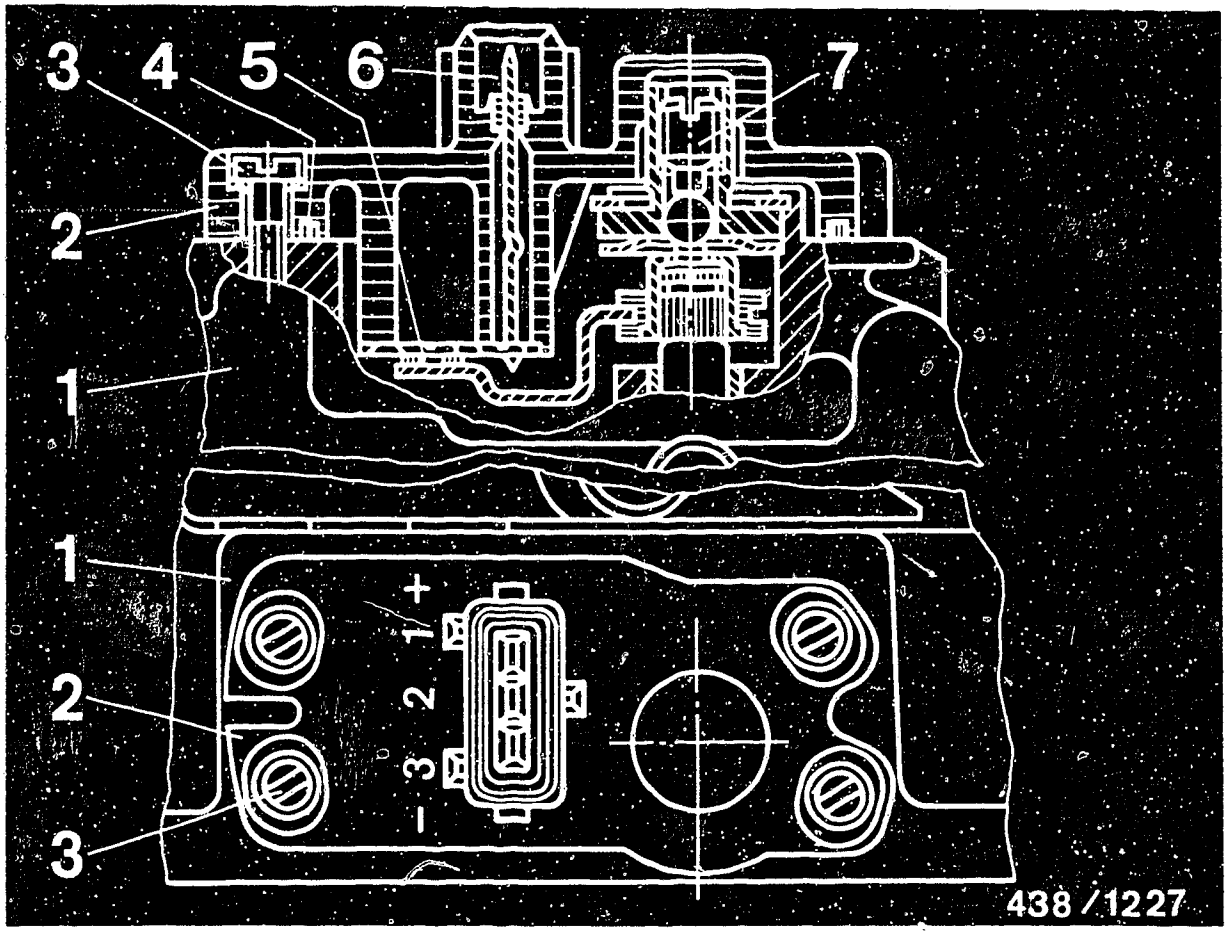
With throttle valve in idle position, the contact must be closed; at 1 ... 2.5° throttle angle it must be open.

To adjust/renew the microswitch, remove throttle-valve assembly.

22. Air-flow sensor with potentiometer

22.1 Construction, operating principle

Air-flow sensors 0 438 121 007 and 0 438 121 008 are equipped with angle sensor for the fuel consumption indicator.
The angle sensor, in the form of a potentiometer, is positioned on the fixed bearing of the air-flow sensor housing. It consists of fixed potentiometer housing and rotatable brush wiper.



1 = Air-flow sensor housing
2 = Potentiometer housing
3 = Fillister-head screw
4 = Seal ring
5 = Brush wiper
6 = 3-pole plug connection
7 = Fixed bearing

By way of the 3-pole plug connection 5 V d.c. is supplied to the potentiometer. At the output there is a voltage between 0 V and 5 V depending on the position of the air-flow sensor plate (idle, part load, full load).
This load-dependent voltage is evaluated by the trip computer to indicate the fuel consumption in the instrument cluster of the instrument panel.

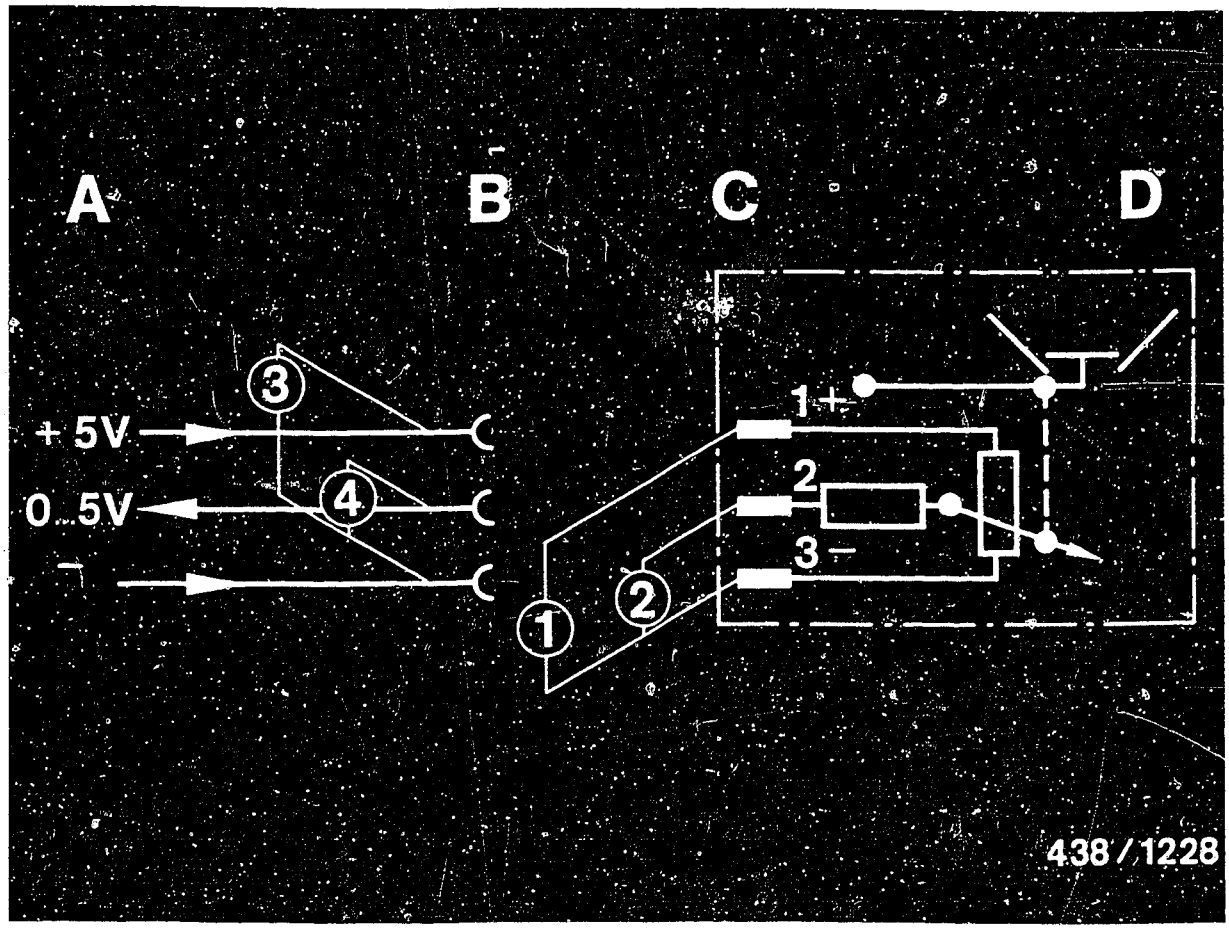
22.2 General information

If necessary, the potentiometer housing can be renewed and is available as a service part.
It is not possible for the after-sales service to renew the brush wiper since its holding ring is pressed permanently onto the shaft end of the control lever bearing shaft.

Renewing the potentiometer housing must be performed with care and attention so that the brush wiper is not damaged. Avoid any contact with the brush wiper.

22.3 Necessary test equipment

Multimeter with R_i at least 20 kΩ/V (commercially available).



22.4 Electrical circuit diagram

A = From instrument cluster
B = Plug housing of connecting lead
C = Connector of potentiometer
D = Potentiometer on air-flow sensor

① and ② = Resistance measurements (plug housing disconnected)

③ and ④ = Voltage measurements (plug housing connected, ignition on)

22.5 Testing and adjusting

Disconnect 3-pole plug connector. Connect ohmmeter to both outer contacts 1 and 3 of connector.

Test specification:
3000 ... 5000 Ω

Test specification reached?

no → Potentiometer housing defective, renew.
Scrape off locking paint of the 4 fastening screws and remove fastening screws. Carefully remove potentiometer.
Do not touch brush wiper.
Position new potentiometer housing with inserted seal ring and screw in fastening screws until light contact is made.

yes ↓

Connect ohmmeter to contacts 2 and 3 of connector. Slowly deflect air-flow sensor plate by hand between idle and full load.

Test specification:
at idle:
500 ... 900 Ω

at full load:
3500 ...6000 Ω

Test specification reached?

no → Reading differs from test specification/reading jumps.

no → Reading ∞ Ω
Brush wiper defective.
Renew air-flow sensor.

yes ↑

yes ↓

Continued on H3/H4

Testing and adjusting (continued)

Remove protective cap from plug housing. Connect plug housing to connector. Carefully connect test prods of voltmeter to the external contacts 1 and 3 of plug housing.
Switch on ignition.

Test specification:
4.7 ... 5.3 V

Test specification reached?

no → Test voltage supply of instrument cluster.
Positive lead to contact 1,
negative lead to contact 3.

yes ↓

Carefully connect test prods of voltmeter to contacts 2 and 3 of plug housing. Switch on ignition.
Air-flow sensor plate in zero position.

Test specification: 0 V
With slight deflection of sensor plate, voltage must rise immediately.
Test specification reached/ voltage rising?

no → Adjusting the potentiometer housing:

Scrape off locking paint of the 4 fastening screws and slightly loosen screws. By turning in the slots, adjust potentiometer housing to

test specification: 0 V.

Tighten fastening screws to tightening torque 1.5 ... 2.0 Nm and secure with locking paint.

yes ↓

Potentiometer O.K.
Fit protective cap onto plug housing.

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor
Blue — securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520

updraft air-flow sensor
Red — Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

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After-sales Service

Technical Bulletin

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 254 ..

VDT-I-438/104 En
3.1983
(Replaces Ed. 5.1982)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal
0 580 254 001	1 587 010 500	---	---
002	500	---	---
0 580 254 003	502	---	---
004	502	---	---
005	502	---	---
006	502	---	---
007	500	---	---
948	005	---	---
949	002	---	---
950	006	---	---
951	006	---	---
952	002	---	---
953	501	---	---
954	002	---	---
956	002	---	---
957	002	---	---
958	002	---	---
959	002	---	---
960	002	---	---
961	002	---	---
962	002	---	---
963	005	---	---

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Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 254 964	1 587 010 002	---	---
965	002	---	---
966	002	---	---
967	002	---	---
968	002	---	---
969	002	---	---
970	002	---	---
971	002	---	---
972	002	---	---
973	002	---	---
974	002	---	---
975	003 (4)	---	---
976	004 (3)	---	---
977	004 (3)	---	---
978	1 587 410 901	---	---
979	010 004 (3)	---	---
980	002	---	---
981	002	---	---
982 (1)	003 (4)	---	---
982 (2)	1 587 410 901	---	---
984	010 004 (3)	---	---
985	---	1 583 385 006	1 580 203 002
986	---	386 011	001
987	---	008	001
988	---	008	001
989	---	008	001
990	---	385 004	002
991	---	004	002
992	1 587 010 001	---	---
996	---	386 011	001
998	---	385 004	002
9 580 234 003	002	---	---
005	002	---	---

1 = up to FD 822 2 = from FD 823

3 = Parts set ..003 also possible (delivery-line connection at 90°)

4 = Parts set ..004 also possible (delivery-line connection axial)

After-sales Service

Motor Vehicle Service Information

COLD START - WARM UP
ACCELERATION PROBLEMS

in vehicles with Jetronic

VDT-I-Gen. 051 En
10.1982

Customer complaints

- Starting problems with a cold engine
- Engine bucking during warm up
- Uneven idle (speed fluctuations)
- Engine cuts out during acceleration (flat spot)
- Loss of output

Cause

When the ignition and the Jetronic have been checked and the test specifications given have been reached, a possible reason for the problems quoted could be coke residue on the intake valves.

The carbon residue thus present delays a continuous flow of fuel from the injection valve to the combustion chamber on account of its sponge effect.

As a result of this the air-fuel mixture can in some cases be so lean, that it can no longer be ignited.

Loss of output results from a reduction in the amount of cylinder filling and is caused by a very high coking.

Complex connections between qualities specific to the engine, the engine oil and fuel used, as well as relevant driving cycles (e.g. mainly short stretches) can cause such coking on the intake valves.

Remedy

Dismantle the intake valves and remove the deposits.

Please note

Various vehicle manufacturers are working at the moment on other measures, such as cleaning with additives. Results of these tests are not yet available.

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After-sales Service

Motor Vehicle Service Information

LIQUID PETROLEUM GAS (AUTOGAS) SYSTEMS AND VEHICLES WITH K-JETRONIC

VDT-I-Gen. 052 En
10.1982

Fitting at a later stage

Vehicles with K or L-Jetronic are not suitable for fitting at a later stage with liquid petroleum gas (LPG) systems.

Numerous problems can occur, such as:

- Reduction of fuel flow through the injection valves due to deposits
- Stiffness or blocking of the K-Jetronic fuel distributor plunger (due to gumming or similar) in the course of time with "gas only operation."
- Increased danger of backfiring in the intake manifold (burbling) and thereby damage to the air-flow sensor.

Guarantee

Guarantee claims for failed Jetronic components from vehicles thus converted will not be accepted.

Conversion to liquid gas operation is made at the risk of the vehicle owner.

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After-sales Service

Motor Vehicle Service Information

Electrical Equipment

FITTING POSITION AND MARKING OF
AIR-FLOW SENSOR PLATE 3 430 100 ..

VDT-I-Gen. 060 En
10.1983

In air-flow sensors for
K and KE-Jetronic

General information/fitting position

As a result of the stamping process during manufacturing, air-flow sensor plates have a sharp and a slightly rounded edge around the circumference. The sharp edge serves for measuring the air flow and must therefore be fitted so that it faces the air stream.

- The sharp measuring edge of the air-flow sensor plate points in the direction of the air filter.
- The slightly rounded edge points in the direction of the air funnel and intake manifold. 6 and 8 cylinder mixture-control units with downdraught air-flow sensor have air-flow sensor plates with a bezel on the otherwise usual rounded edge.

Marking

- Up till now most air-flow sensor plates have been marked on a surface with 5 punch marks or with the word "TOP".
  This marked surface must always be at the top of the air-flow sensor.
  This applies to both updraught and downdraught air-flow sensors.
- For precision reasons, an increasing number of air-flow sensor plates will be ground at the circumference during production as from mid-1983. On account of the sharp-edged surfaces on both sides, there will be no marking of any kind. These air-flow sensor plates can be fitted whichever way is desired.

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